2D RAMBLINGS THROUGH 3D GEOLOGY IN THE WELSH BORDERLANDS (AND A BIT OF THE ENGLISH BORDERLANDS..)

A DISCUSSION WITH GEOSCIENCE WALES IN CONWY

NOVEMBER 20th 2025

MALCOLM BUTLER
(UK ONSHORE GEOPHYSICAL LIBRARY)

ALL SEISMIC AND WELL DATA UTILISED IN THIS PRESENTATION ARE FREELY AVAILABLE THROUGH www.ukogl.org.uk

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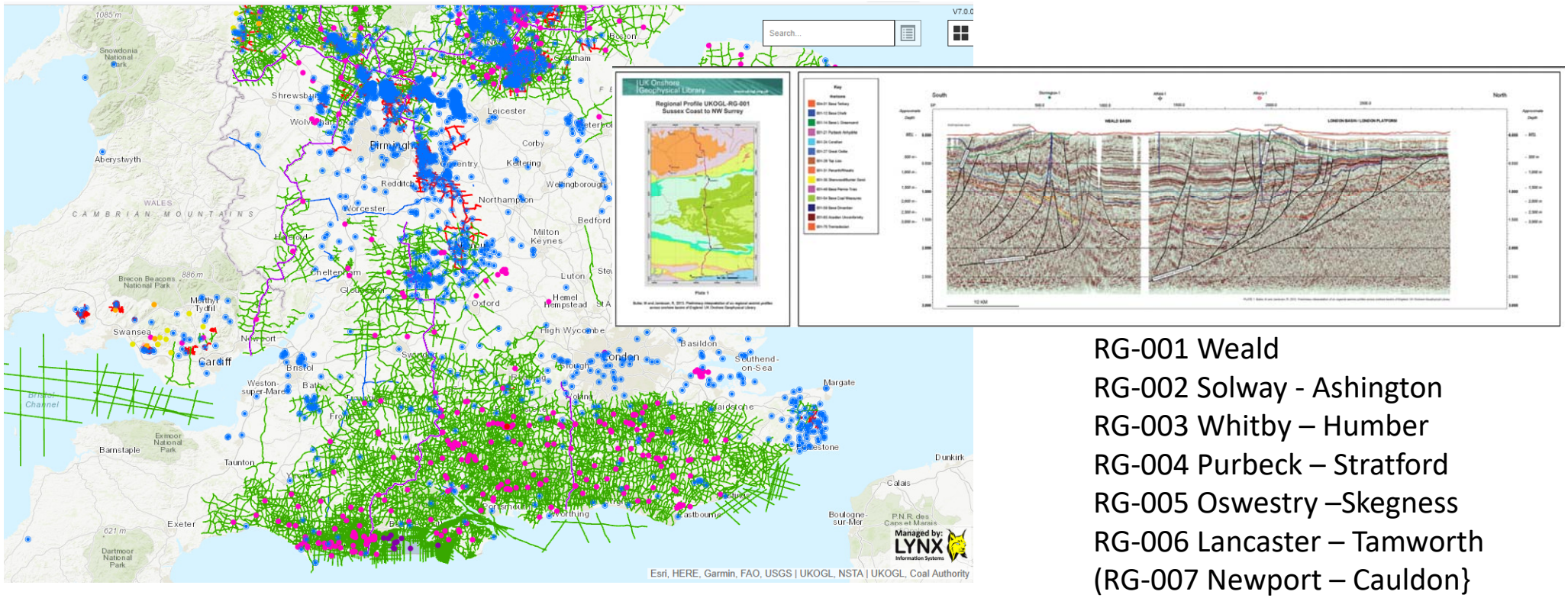
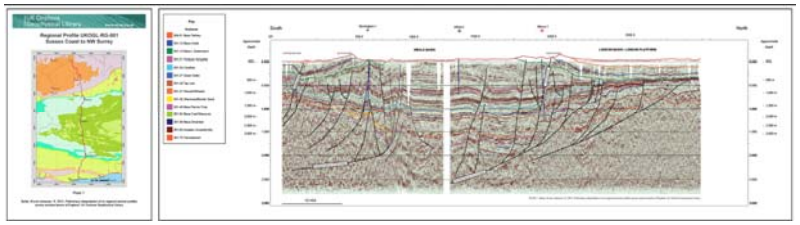
UKOGL REGIONAL PROFILES

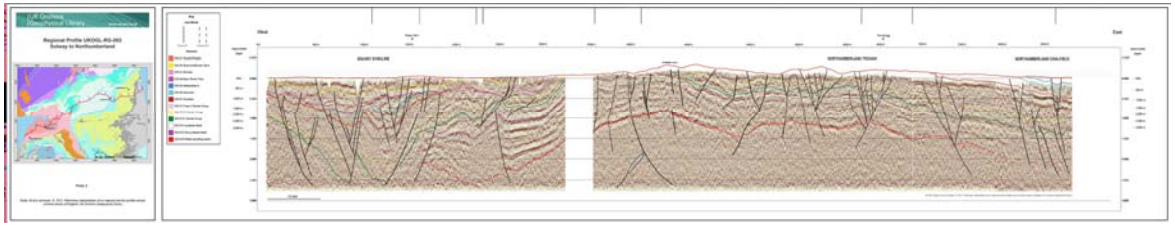


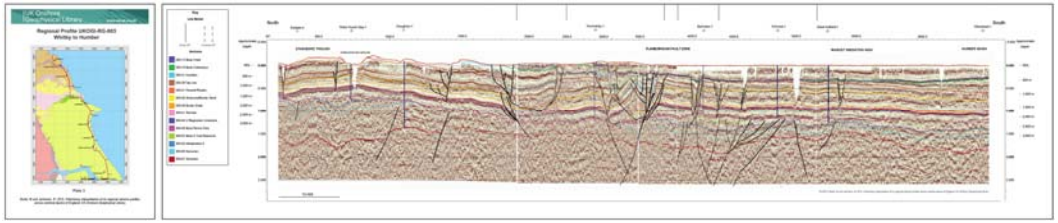
RG-001 Weald
RG-002 Solway - Ashington
RG-003 Whitby – Humber
RG-004 Purbeck – Stratford
RG-005 Oswestry –Skegness
RG-006 Lancaster – Tamworth
(RG-007 Newport – Cauldon}

Having completed the seismic archive and an extensive well database, Butler & Jamieson (2013) constructed a series of six regional profiles by post-stack processing to balance amplitudes, migrating, then splicing multiple lines to form cross-sections and finally interpreting them using ties from wells and intersecting lines. The original intention had been to produce seven regional profiles – but time (and financial) constraints, gaps in control and complicated geology meant RG-007 was put on the back-burner…..

UK Onshore Geophysical Library



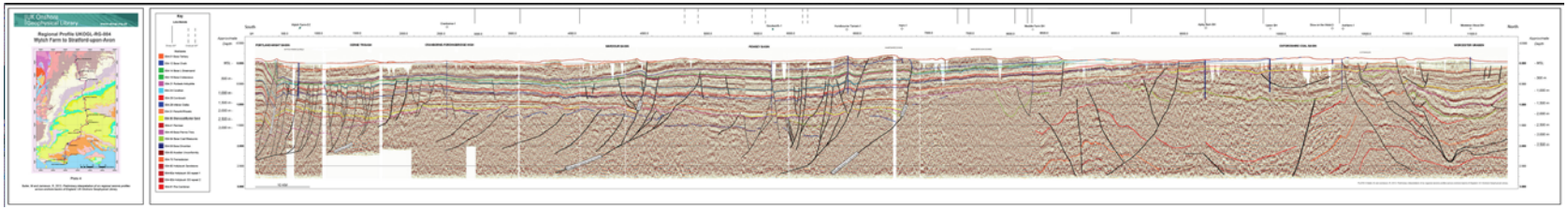


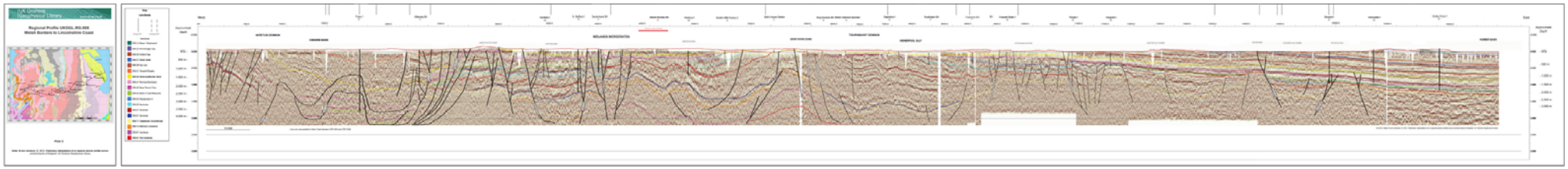


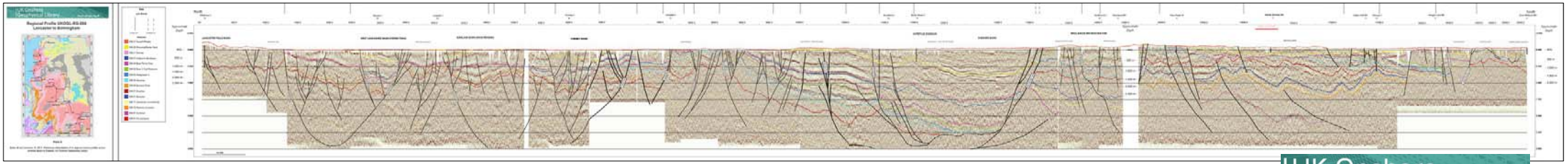
CURRENT UKOGL REGIONAL PROFILES

(Butler and Jamieson, 2013)

EACH DOWNLOADABLE AS SEG-Y OR IMAGE
(WITH OR WITHOUT INTERPRETATION)







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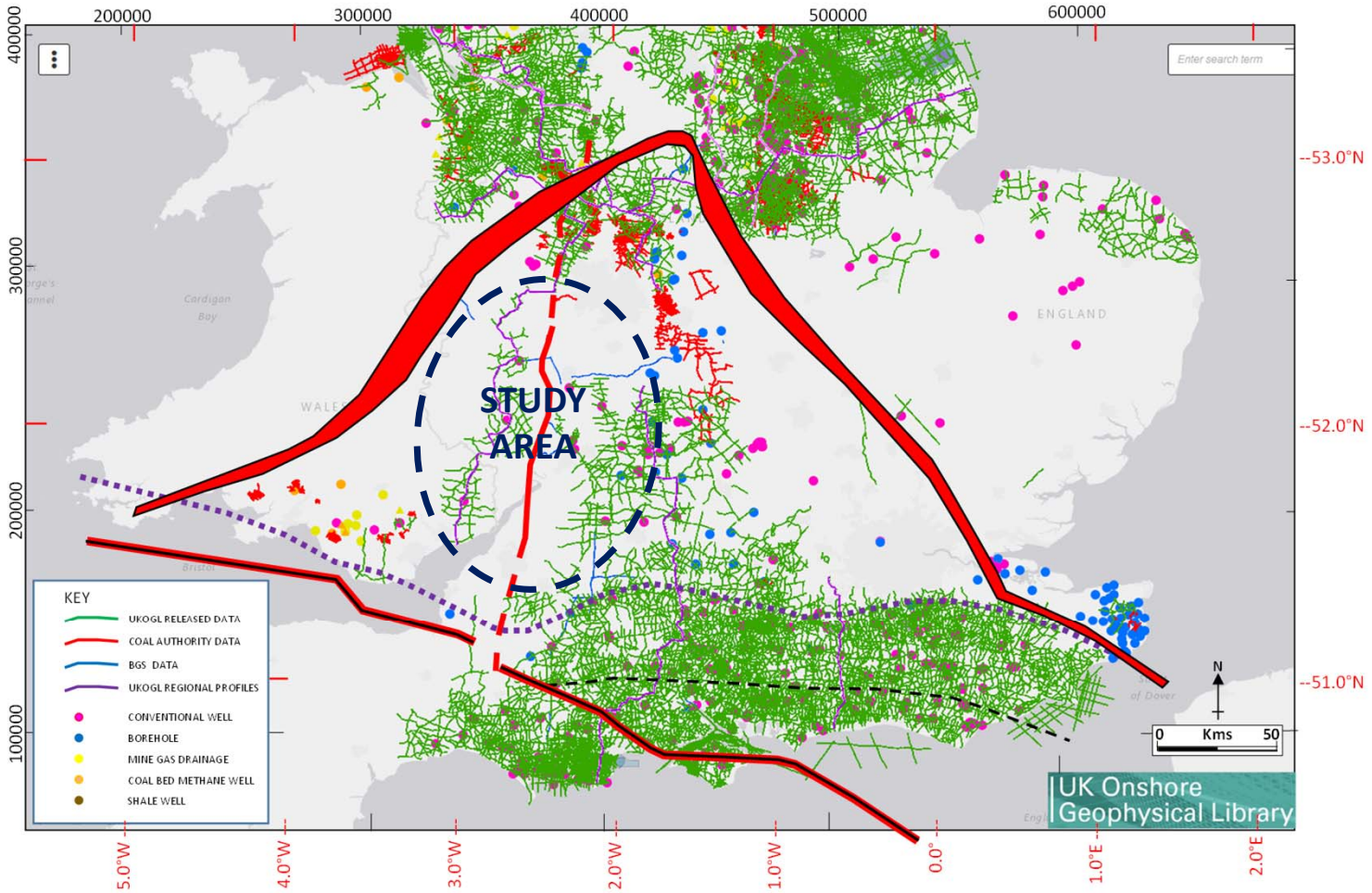
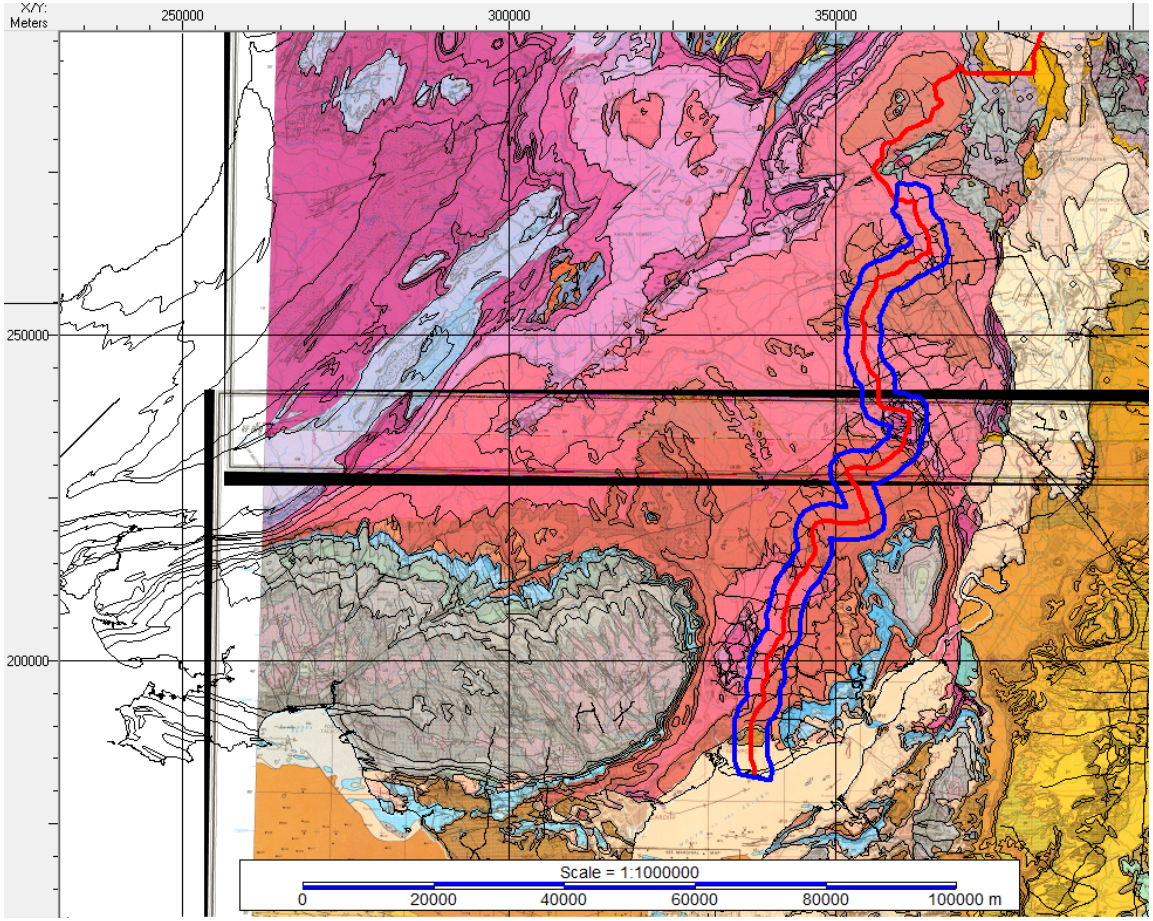
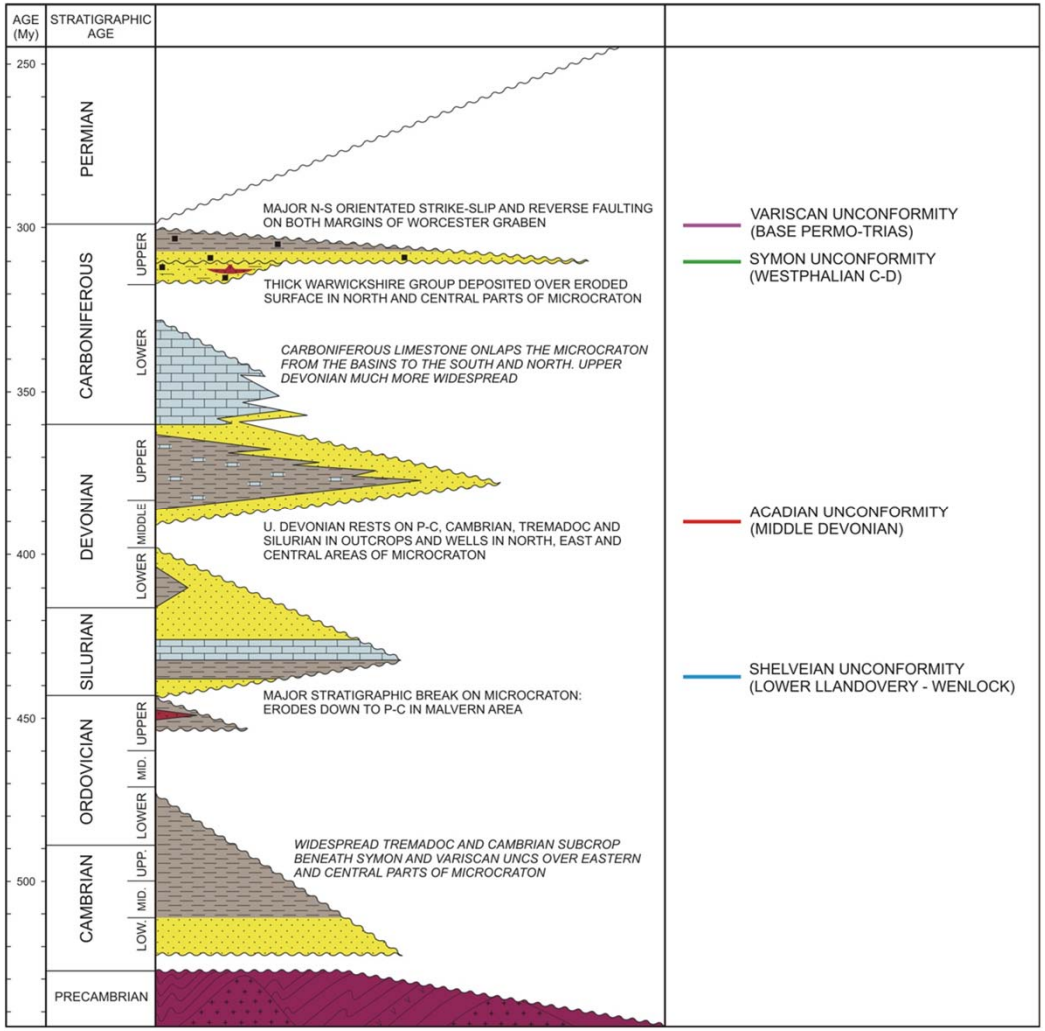
UKOGL SEISMIC AND WELL DATABASE, WITH MIDLANDS MICROCRATON OUTLINED



BGS 1:250,000 GEOLOGY, SHOWING THE LINE OF THE SOUTHERN HALF OF RG-007

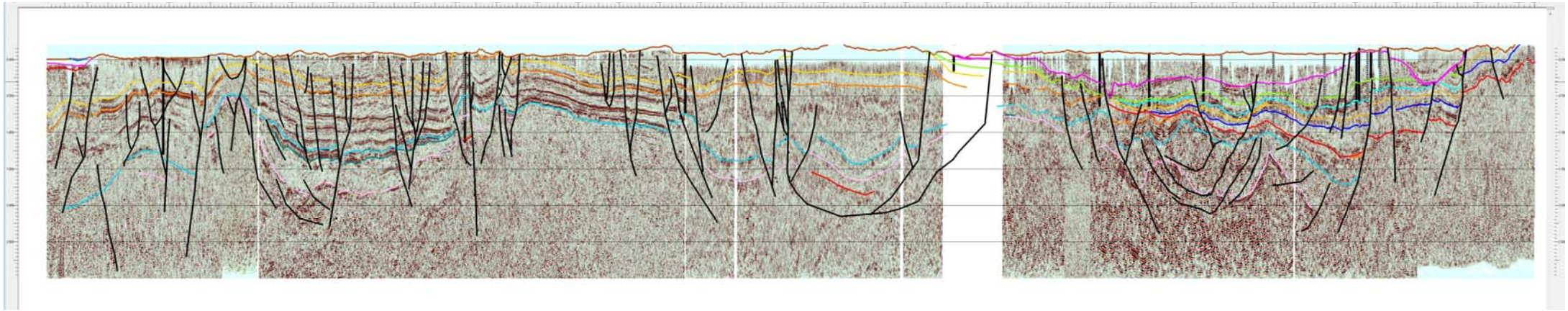


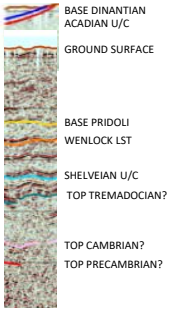
STRATIGRAPHIC “PACKAGES” AND UNCONFORMITIES IN THE AREA OF INTEREST



From: Butler, 2018

UKOGL REGIONAL PROFILE RG-007 – CURRENT STATUS rev 16/11 – and still work in progress!





15 km

WELSH BORDERLANDS:

LINE RUNS OBLIQUELY TO LLANDOVERY DEPOSITIONAL THICKENING IN THE USK AREA AND RUNS PARALLEL TO BASIN-BOUNDING FAULTS IN NORTHERN END

SOUTH STAFFORD BASIN:

INTERPRETATION INCORPORATES SEVERAL 90º BENDS TO TIE WELLS AND RUNS PARALLEL TO BASIN-BOUNDING FAULTS

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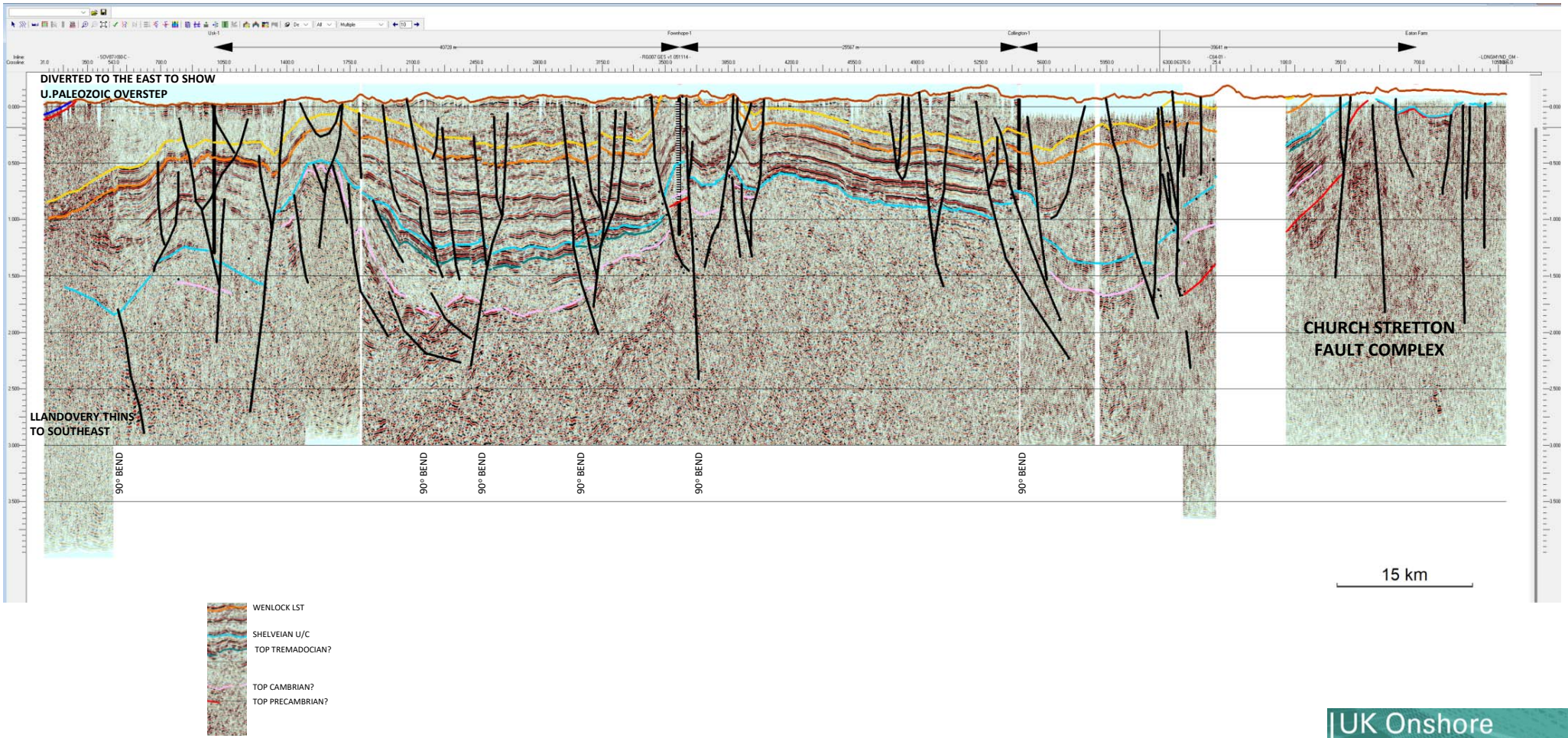
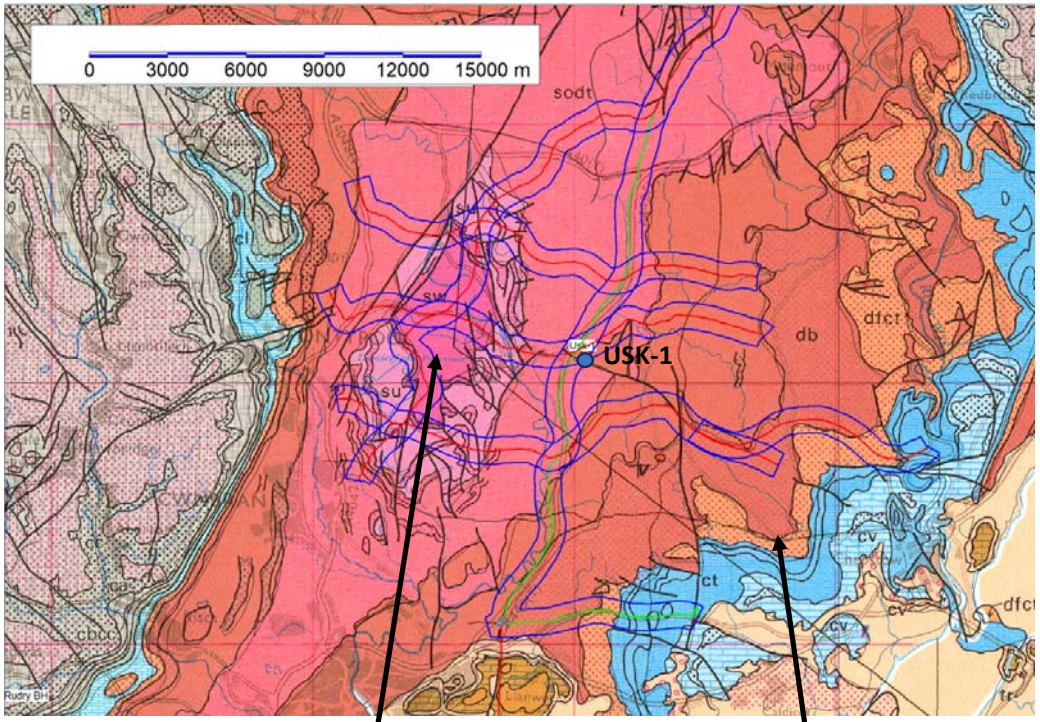
UKOGL REGIONAL PROFILE RG-007 – THE WELSH BIT (DIVERTED TO THE LONGMYND)

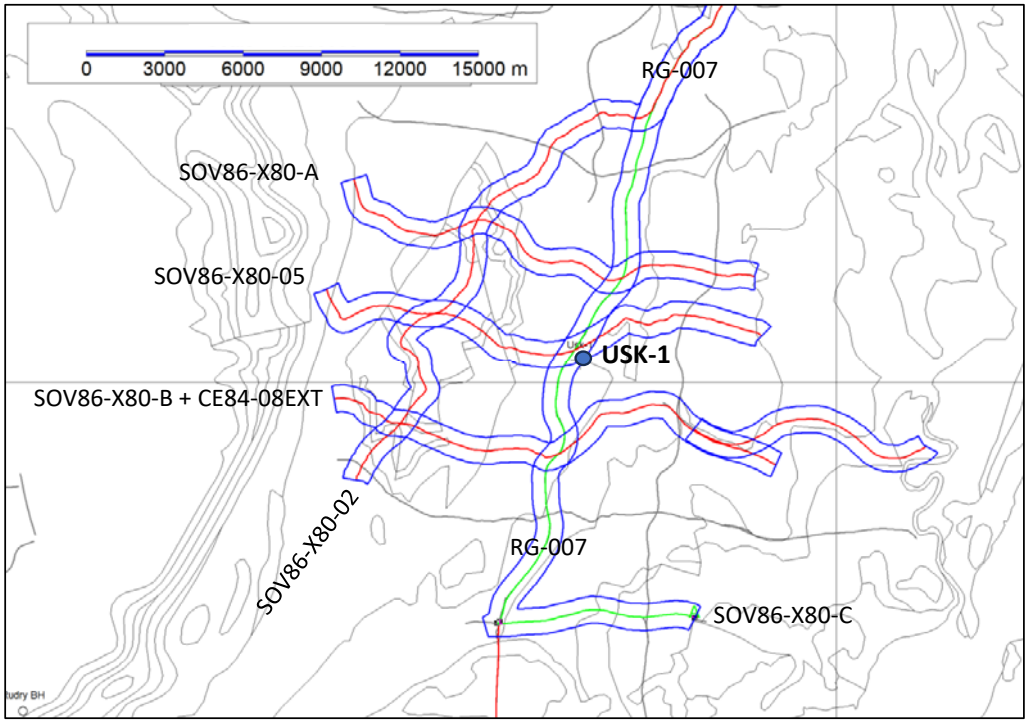


USK BASIN BASE MAPS



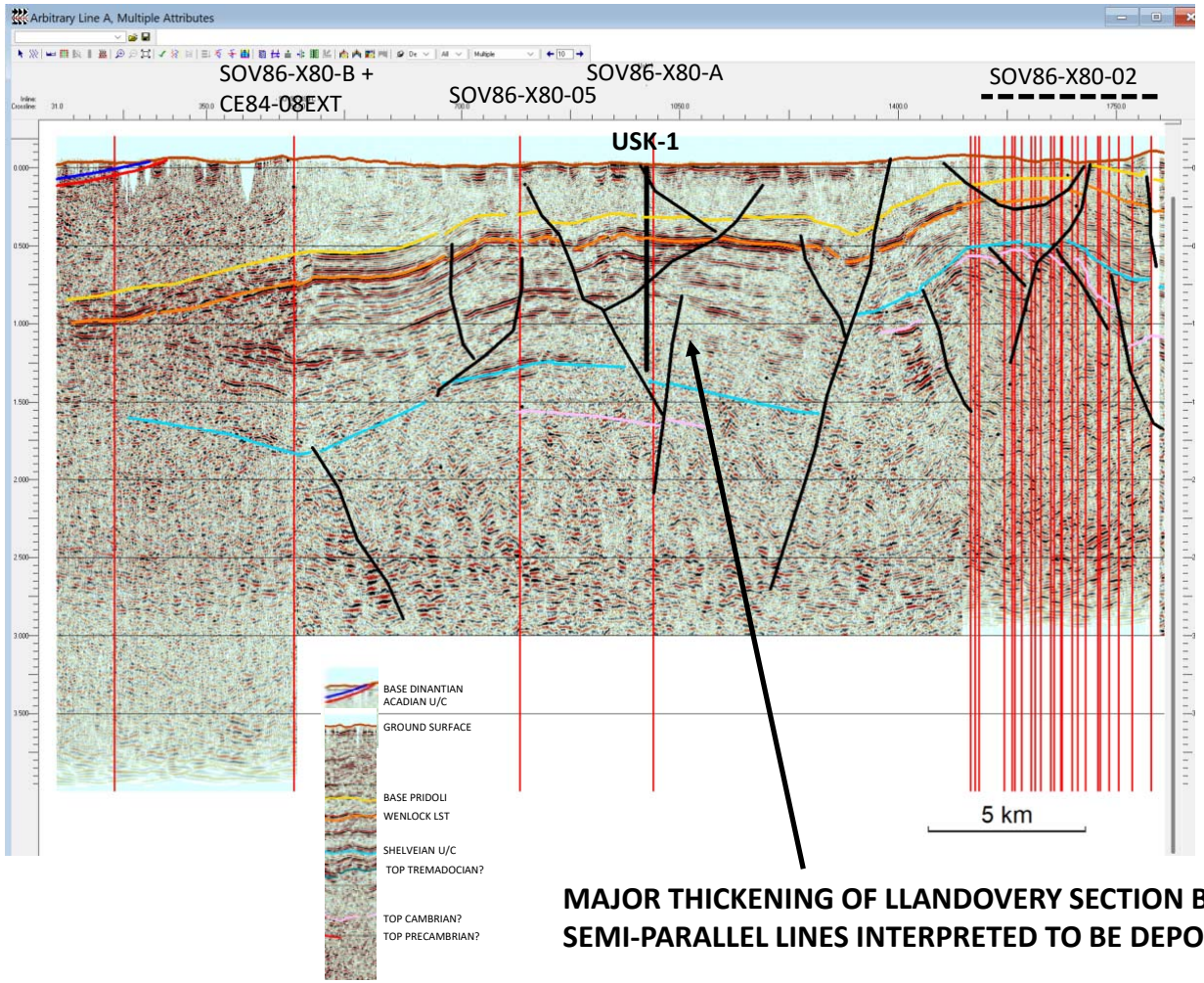
OUTCROP OF WENLOCK LIMESTONE IN CENTRE OF USK ANTICLINE

ACADIAN UNCONFORMITY

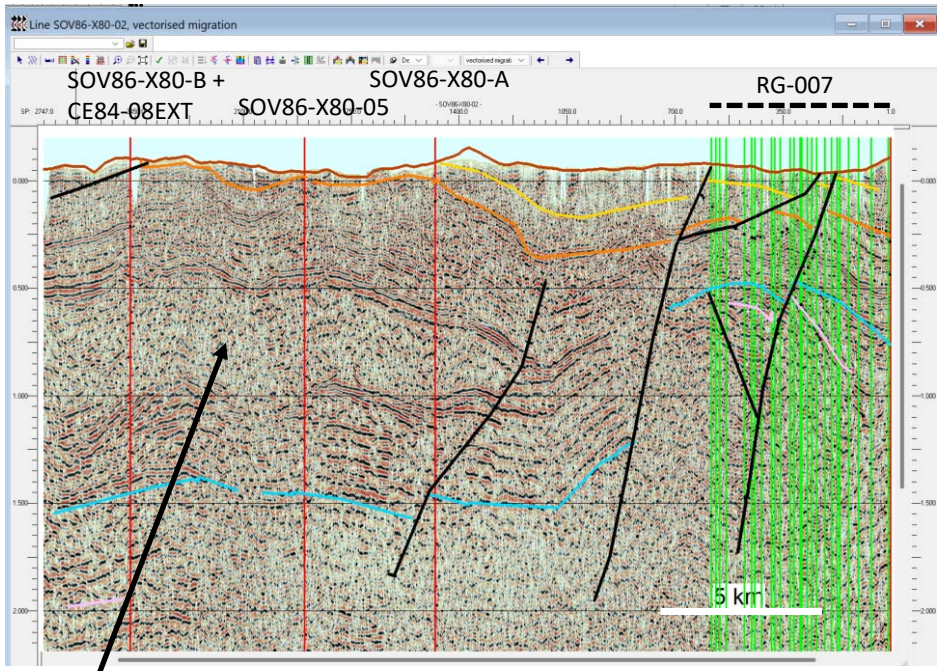


USK BASIN "STRIKE" LINES

SSW **RG-007** NNE



SW SOV86-X80-02 NE



Davies (2025) p.49 Text Box 6: "A pertinent question is: Where are the predicted products of the extensive erosion that accompanied Shelveian uplift?"

MAJOR THICKENING OF LLANDOVERY SECTION BETWEEN THESE SEMI-PARALLEL LINES INTERPRETED TO BE DEPOSITIONAL

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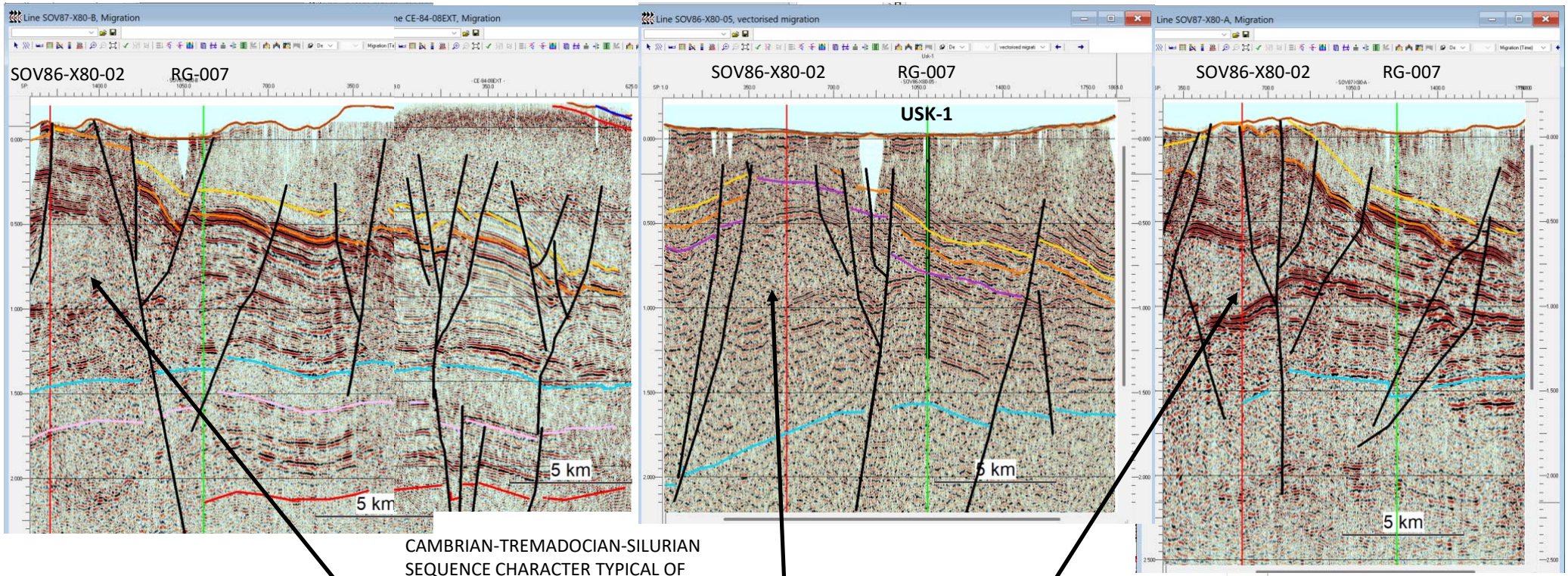
USK BASIN "DIP" LINES

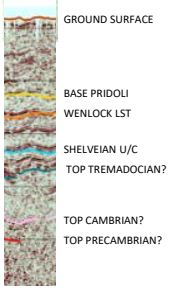
W SOV86-X80-B CE-84-08EXT E W SOV86-X80-05 E W SOV86-X80-A E



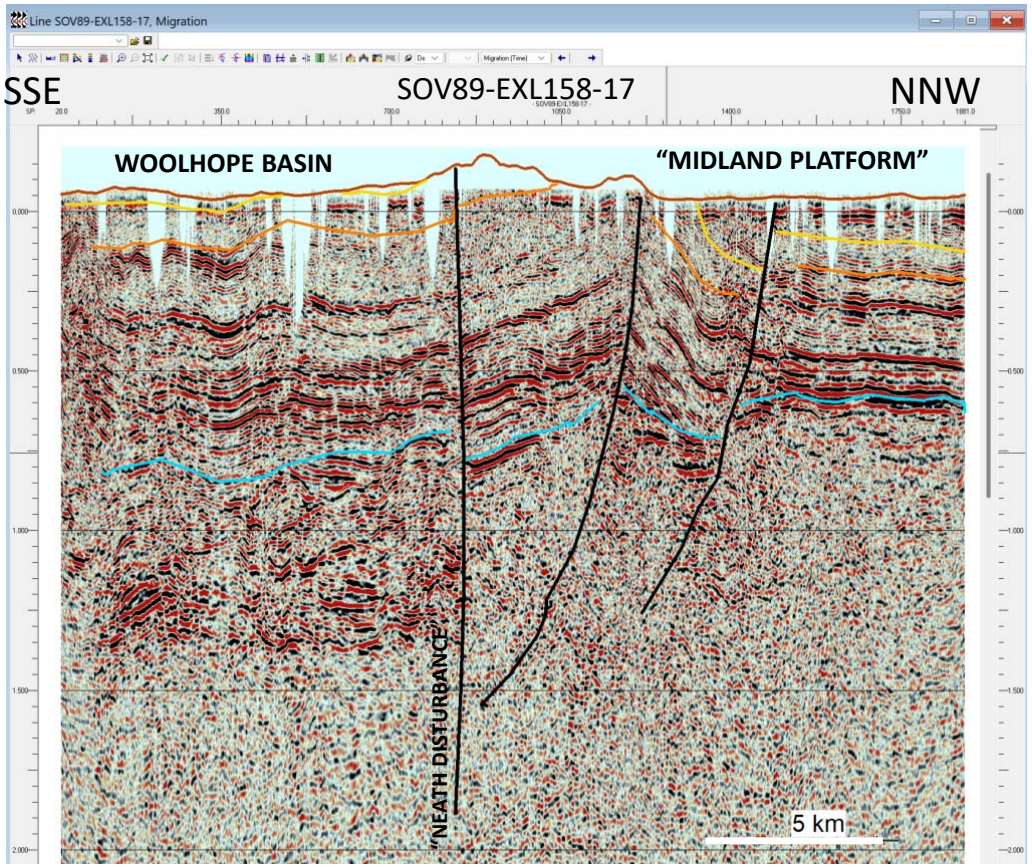
CAMBRIAN-TREMADOCIAN-SILURIAN SEQUENCE CHARACTER TYPICAL OF AREAS ACROSS "MALVERN LINE" TO THE EAST

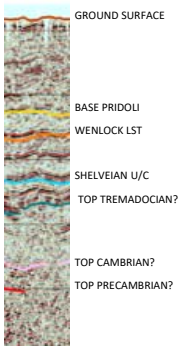
THIS MAJOR WESTWARD THICKENING OF THE LLANDOVERY WAS ORIGINALLY INTERPRETED AS DUE TO DUPLICATION OF SECTION BY THRUSTING (see Butler *et.al.,*1997)

MAJOR THICKENING OF LLANDOVERY SECTION INTERPRETED TO BE DEPOSITIONAL SEDIMENT DERIVATION POSTULATED TO BE FROM NW (NEATH DISTURBANCE?)

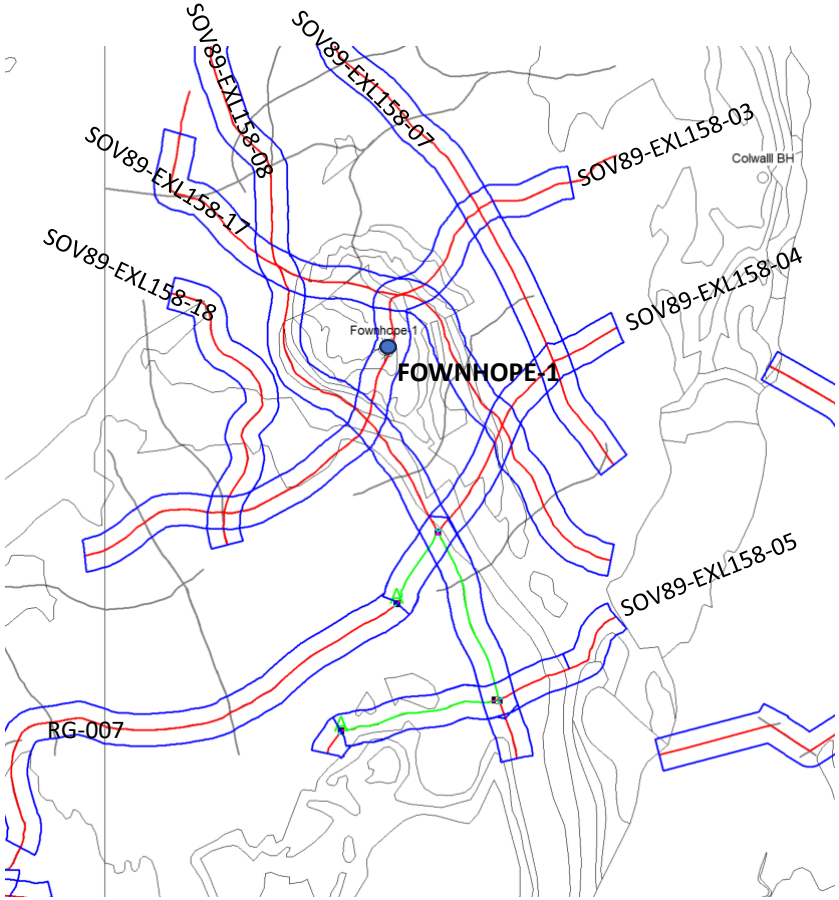


WOOLHOPE DOME AREA





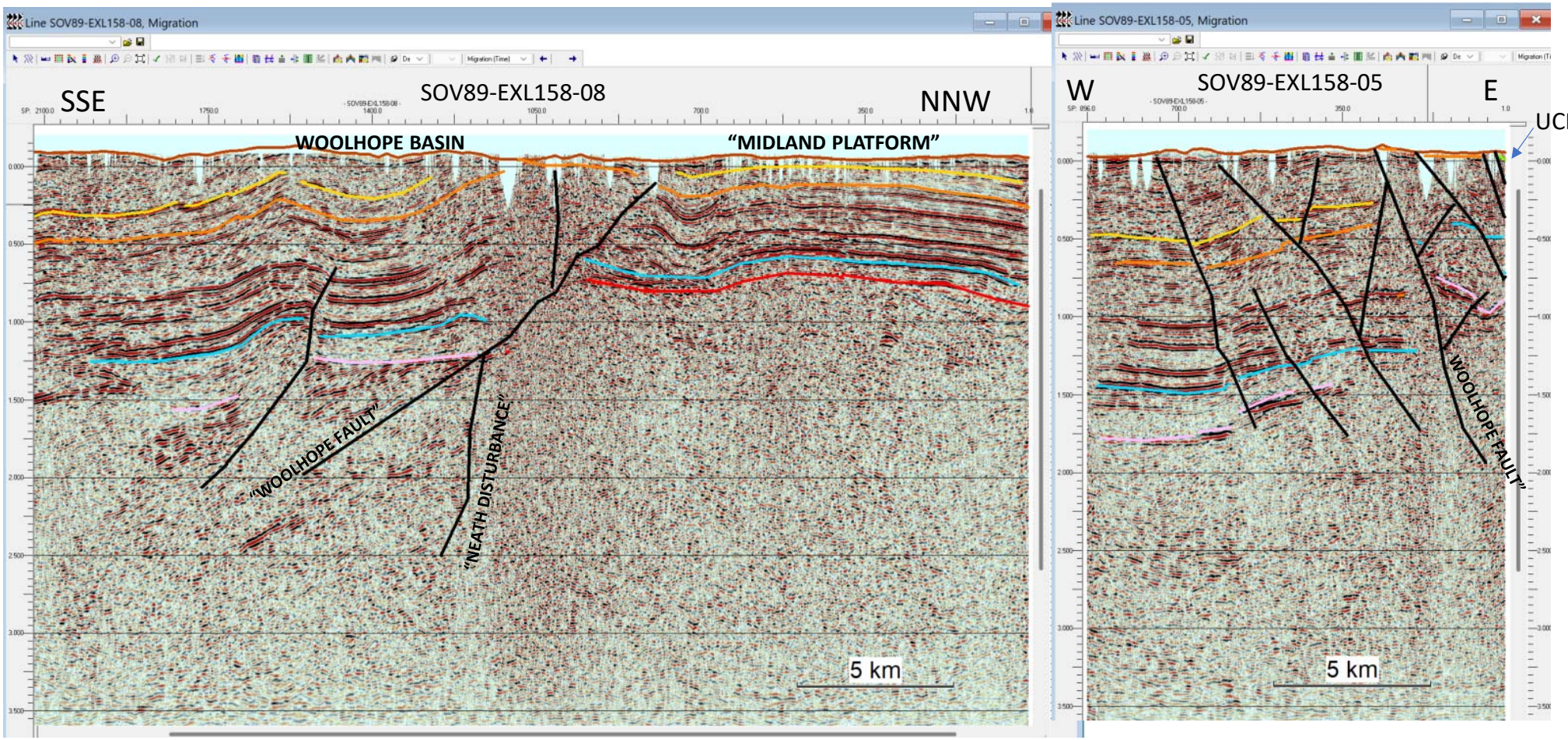
EXAMPLE LINE ON EASTERN SIDE OF WOOLHOPE DOME TO SHOW ABRUPT CHANGE IN PRE-SHELVEIAN SUBCROP



LOCATION MAP FOR FOWNHOPE-1 (WOOLHOPE DOME) AREA

WOOLHOPE DOME – FOWNHOPE-1 AREA LINES

IN SE CORNER OF EXL158, WITH BOUNDING FAULT TO WORCESTER GRABEN AT E END

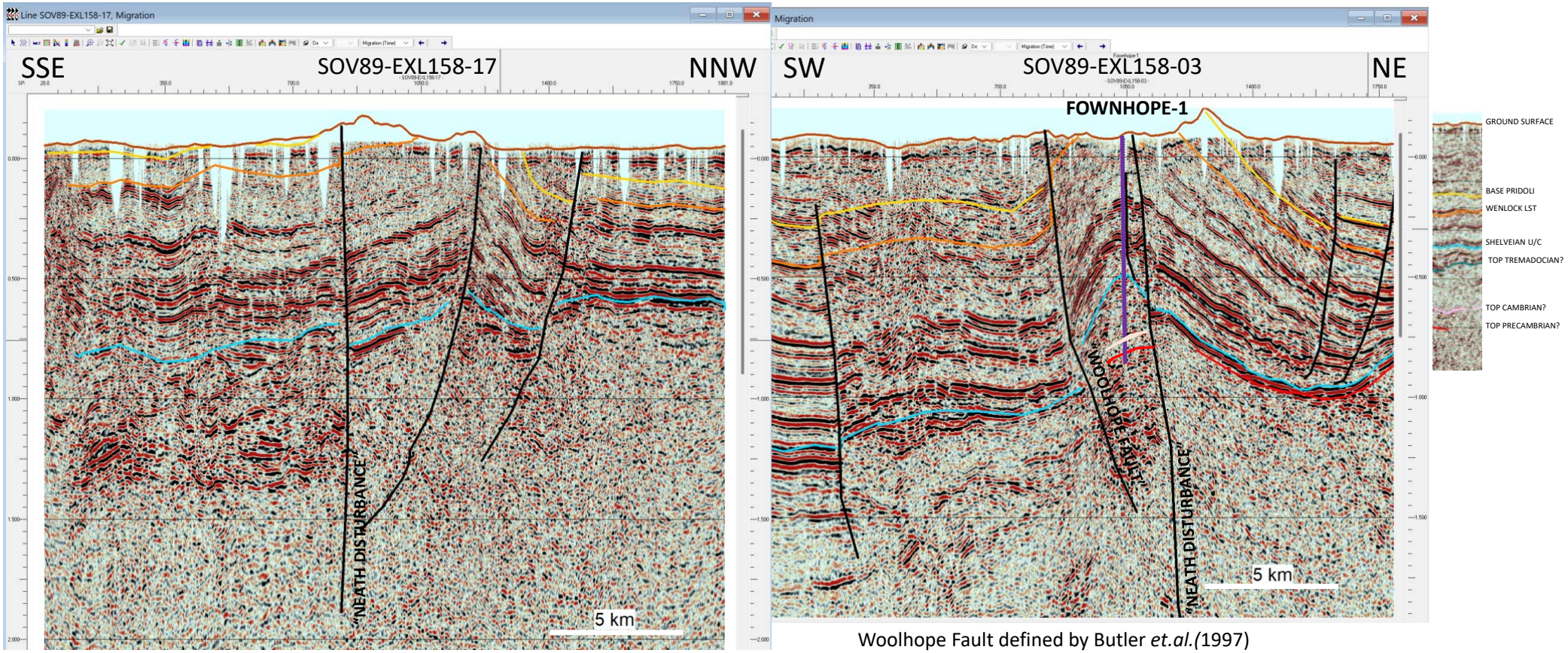


ACROSS NW SIDE OF WOOLHOPE DOME WHERE NEATH DISTURBANCE APPEARS TO BE OFFSET BY WOOLHOPE FAULT – BUT UNCLEAR!

WOOLHOPE DOME – FOWNHOPE-1 AREA LINES

ACROSS EASTERN SIDE OF WOOLHOPE DOME

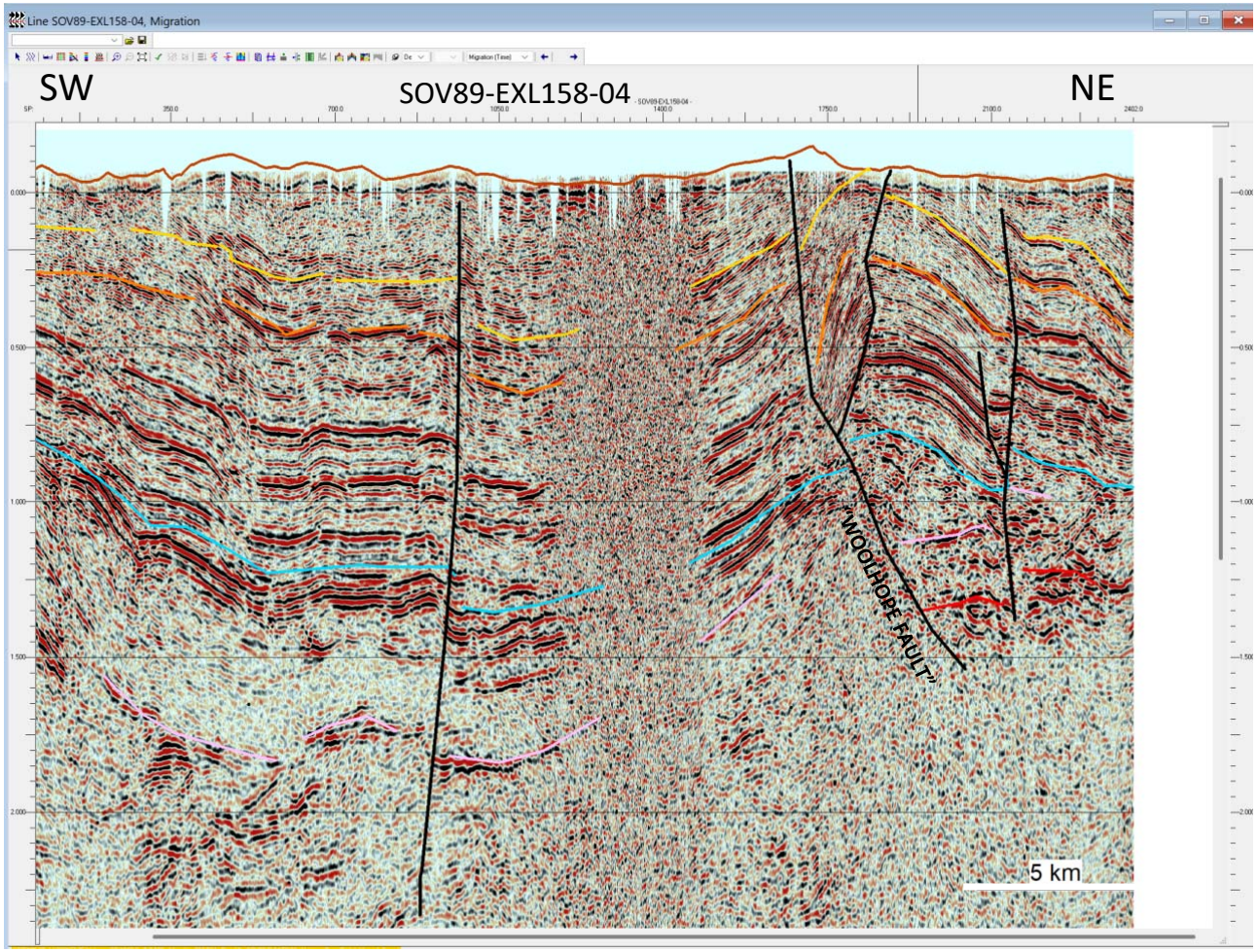
FOWNHOPE-1 ON WOOLHOPE DOME



Woolhope Fault defined by Butler *et.al.(*1997)

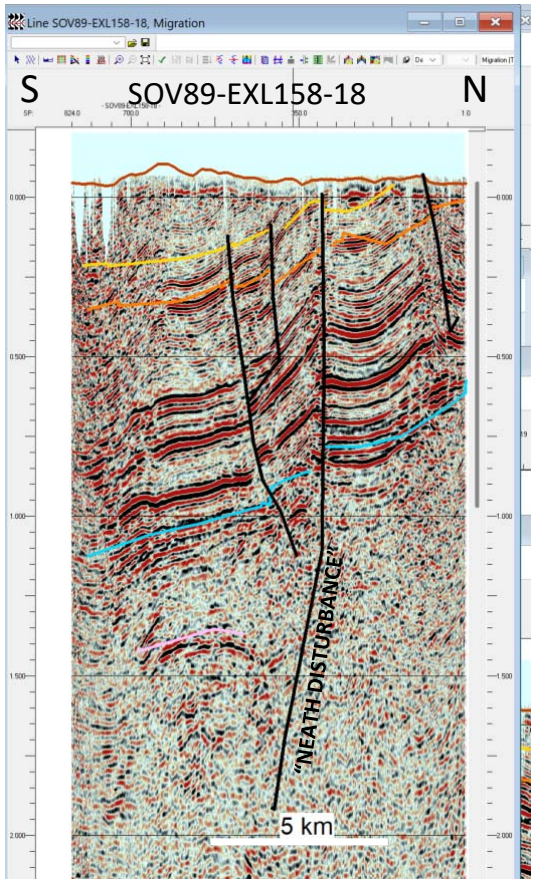
WOOLHOPE DOME – FOWNHOPE-1 AREA LINES

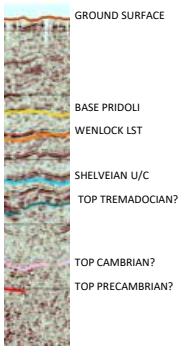
SOUTH OF NEATH DISTURBANCE ACROSS PLUNGING NOSE OF WOOLHOPE DOME



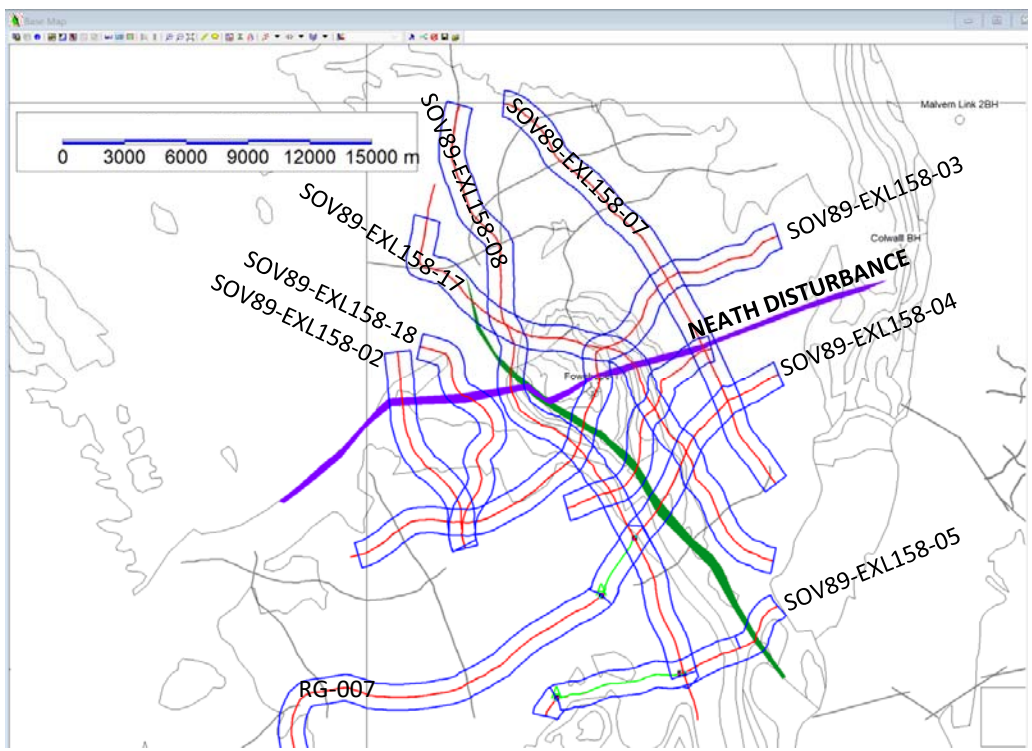
NOT THE NEATH DISTURBANCE

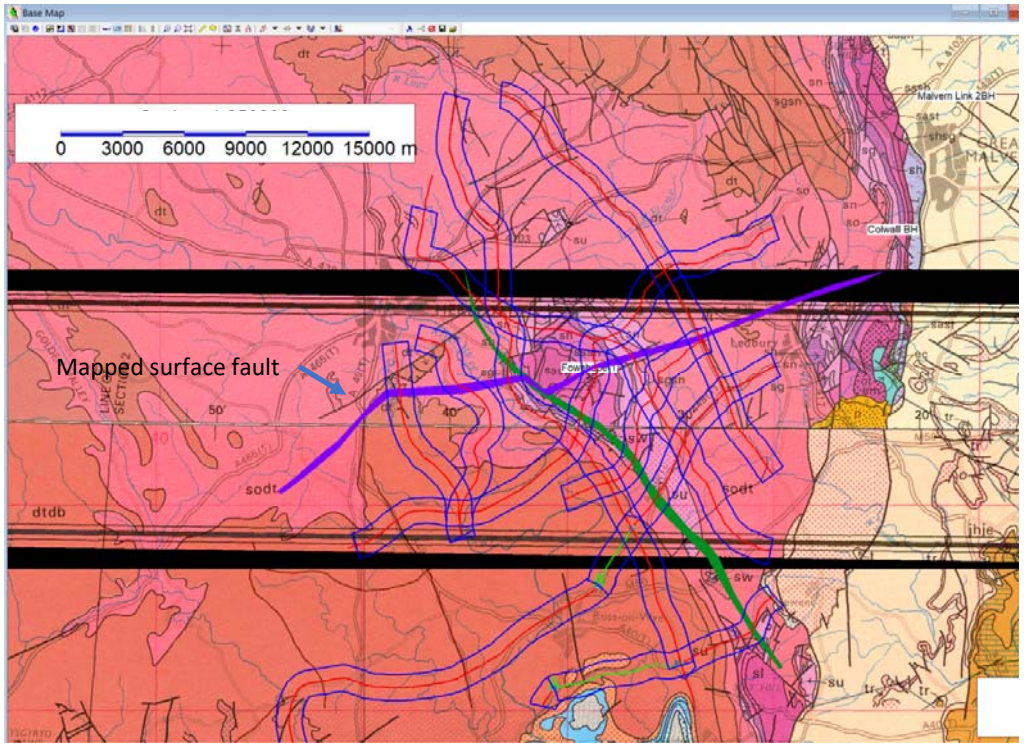
THROUGH NEATH DISTURBANCE
WEST OF WOOLHOPE DOME





WOOLHOPE DOME – FOWNHOPE-1 AREA BASE MAPS

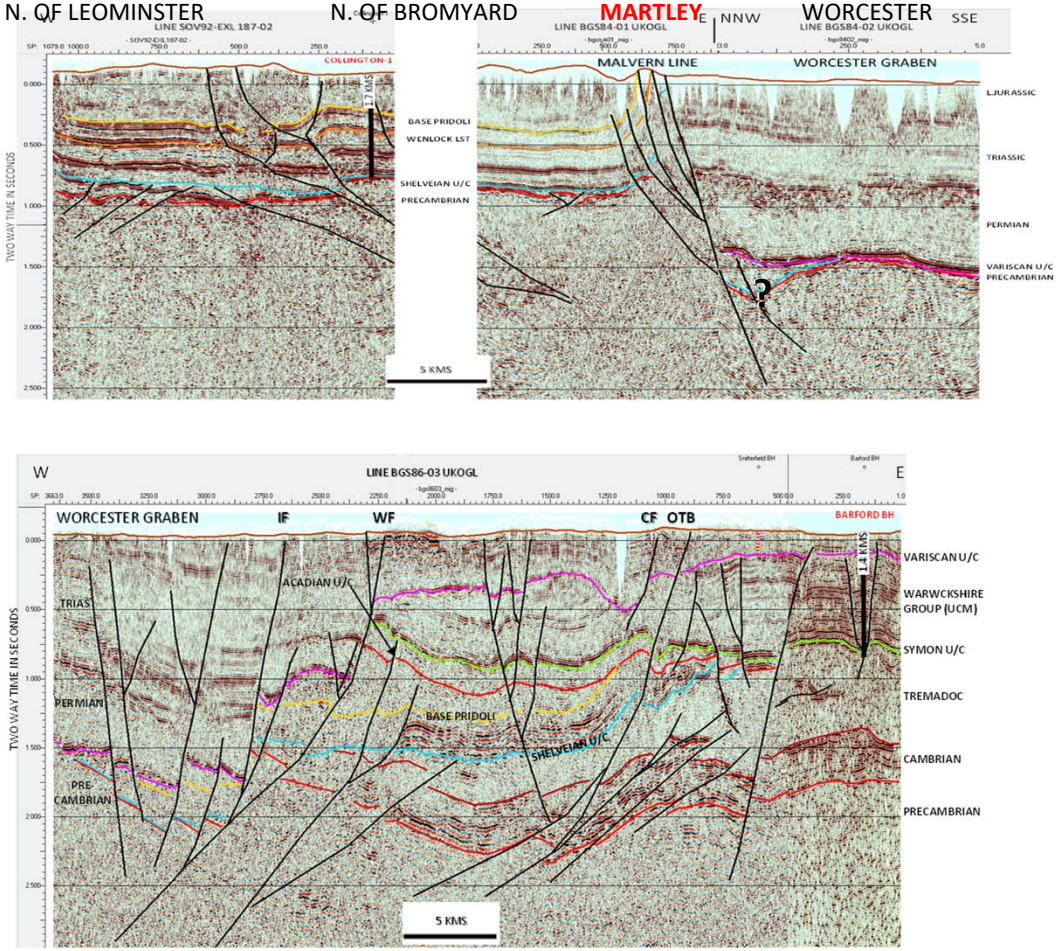


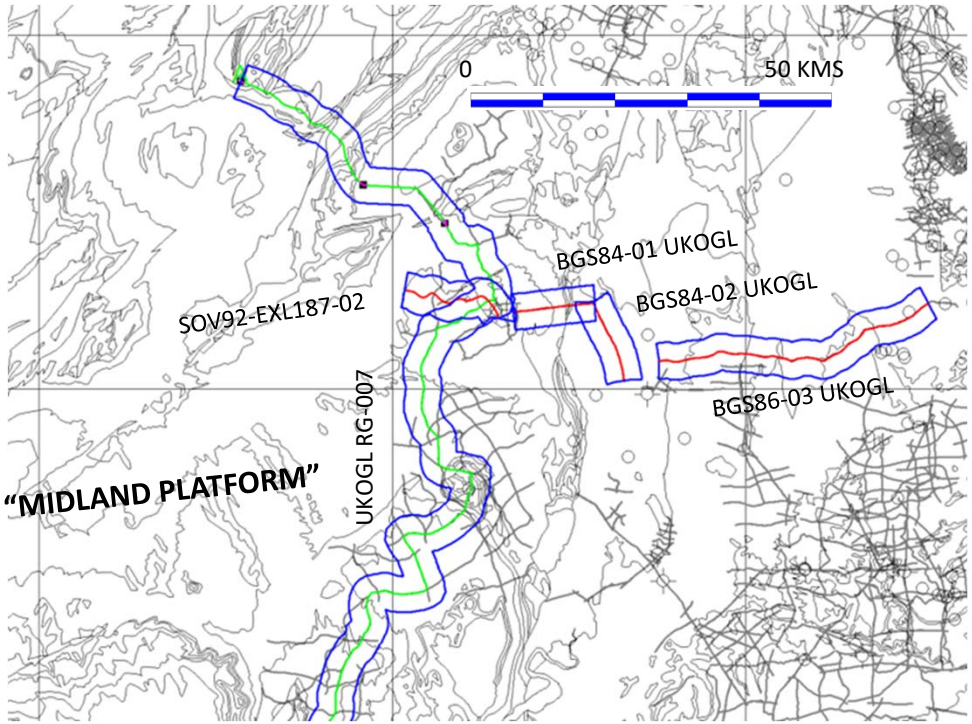


APPARENT OFFSET OF NEATH DISTURBANCE BY WOOLHOPE REVERSE FAULT

Note that the position of the Neath Disturbance is shown as being immediately north of the Woolhope Dome by Davies (2025, figure 6), following the line of the mapped surface fault. It is likely that the Disturbance consists of a complex zone of small faults, many of which are too small to be imaged on seismic data.

W-E PROFILES THROUGH COLLINGTON-1 AND ACROSS THE WORCESTER GRABEN

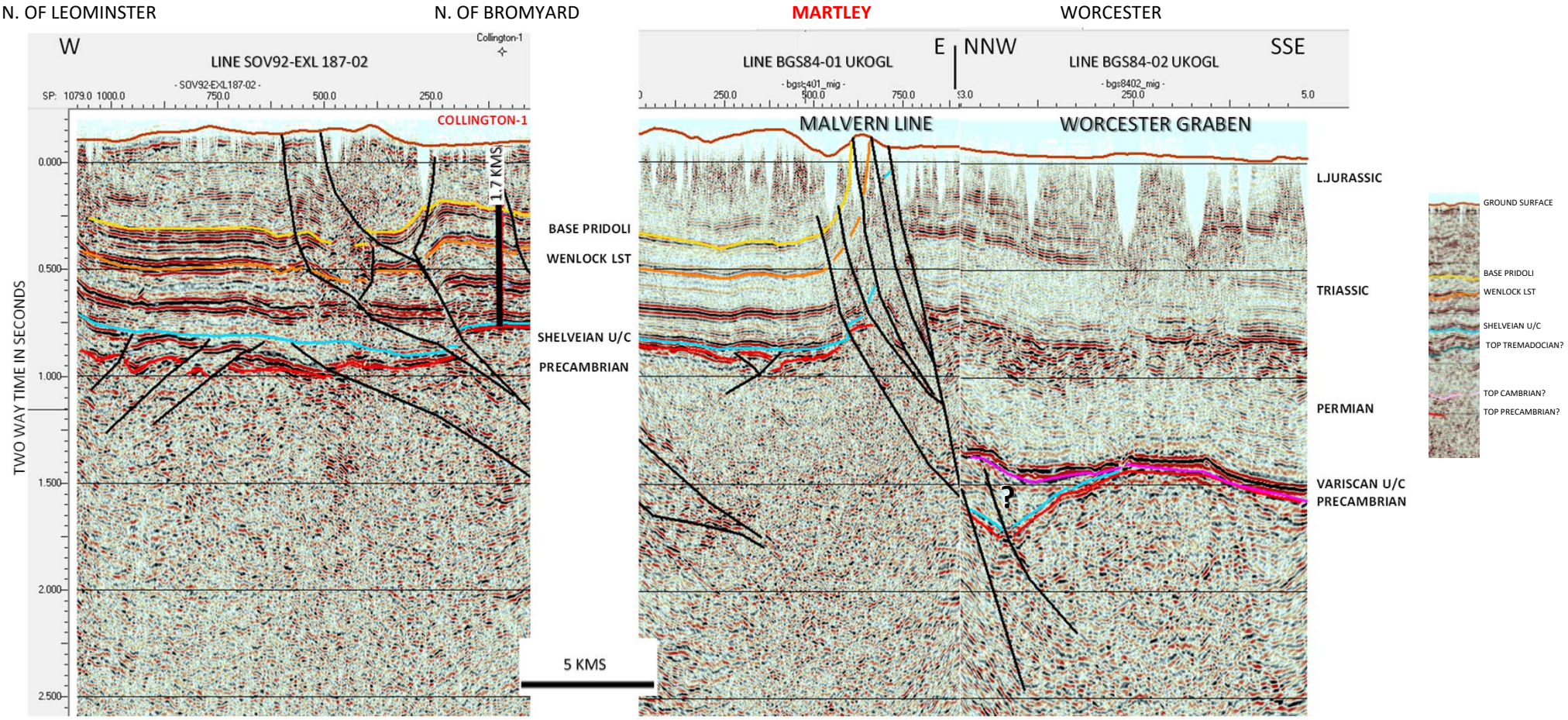




BGS LINES REPROCESSED AND MIGRATED BY UKOGL

COMBINED W-E PROFILE THROUGH COLLINGTON-1 AND ACROSS T0 THE WORCESTER GRABEN

SHOWING SILURIAN SEQUENCE FOLDED/THRUST UP TO THE EAST AGAINST THE MALVERN LINE WITHOUT OBVIOUS THINNING



After: Butler, 2018

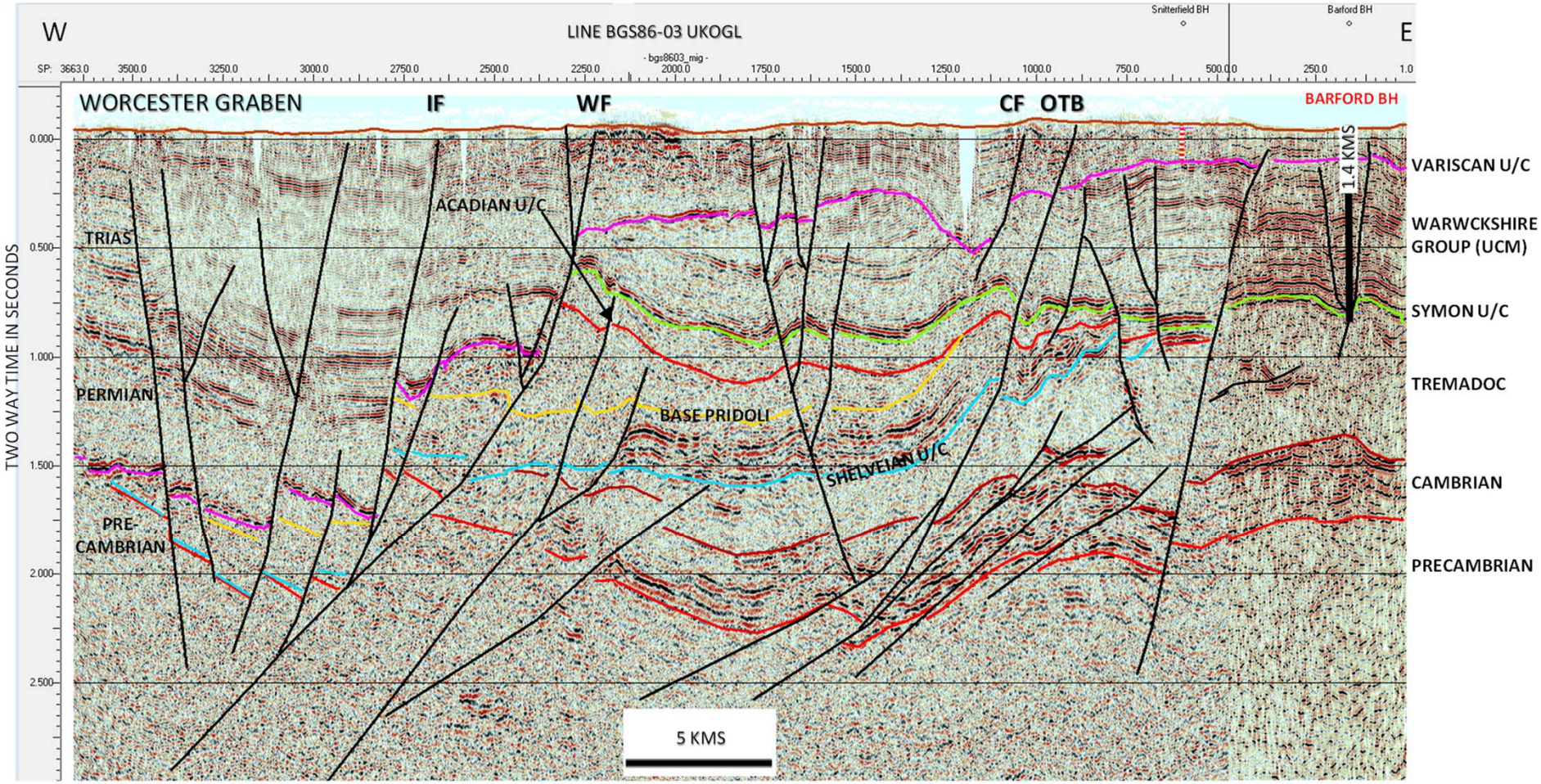
BGS LINES REPROCESSED AND MIGRATED BY UKOGL

UK Onshore Geophysical Library

BGS STRATFORD LINE

SHOWING SIMILAR SILURIAN AND OLDER SEQUENCE TO THAT OF THE WELSH BORDERLANDS AND DOWN-CUTTING SHELVEIAN U/C

E. WORCESTER INKBERROW S.OF ALCESTER N.OF STRATFORD-ON-AVON

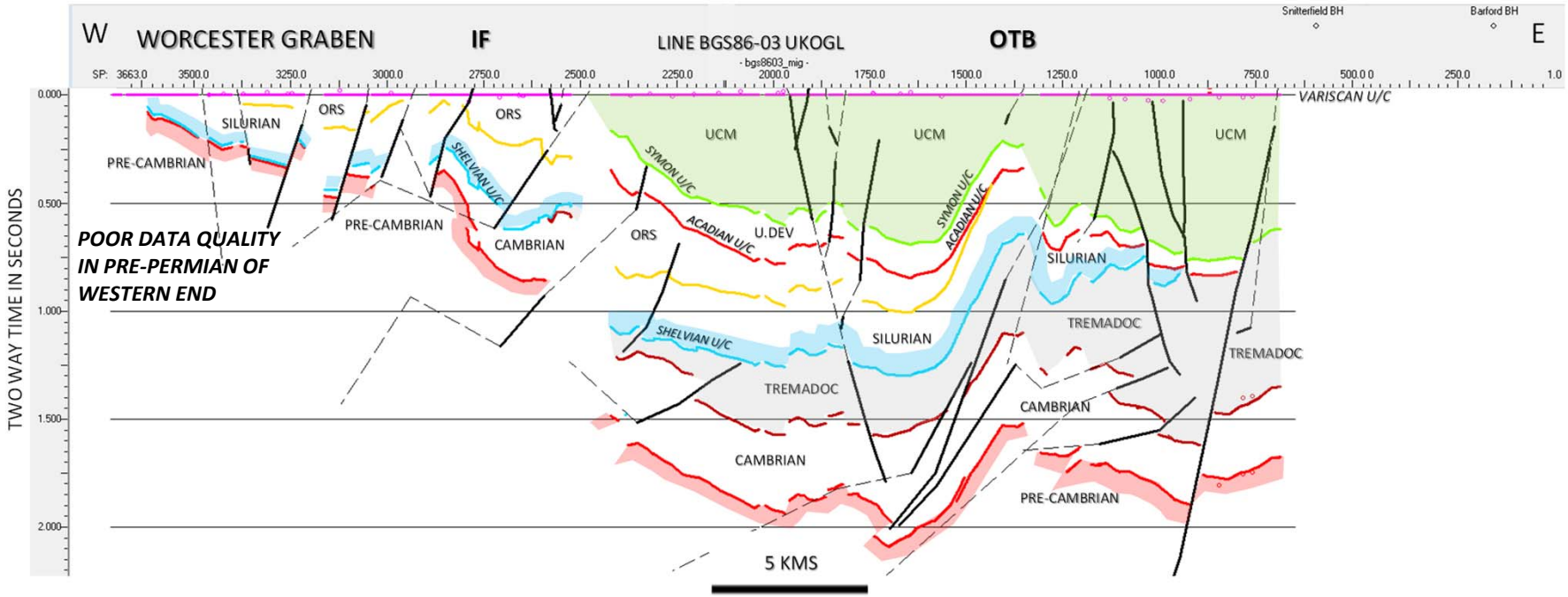


After Butler, 2018

BGS LINE REPROCESSED FROM ORIGINAL FIELD TAPES AND MIGRATED BY UKOGL

BGS STRATFORD LINE

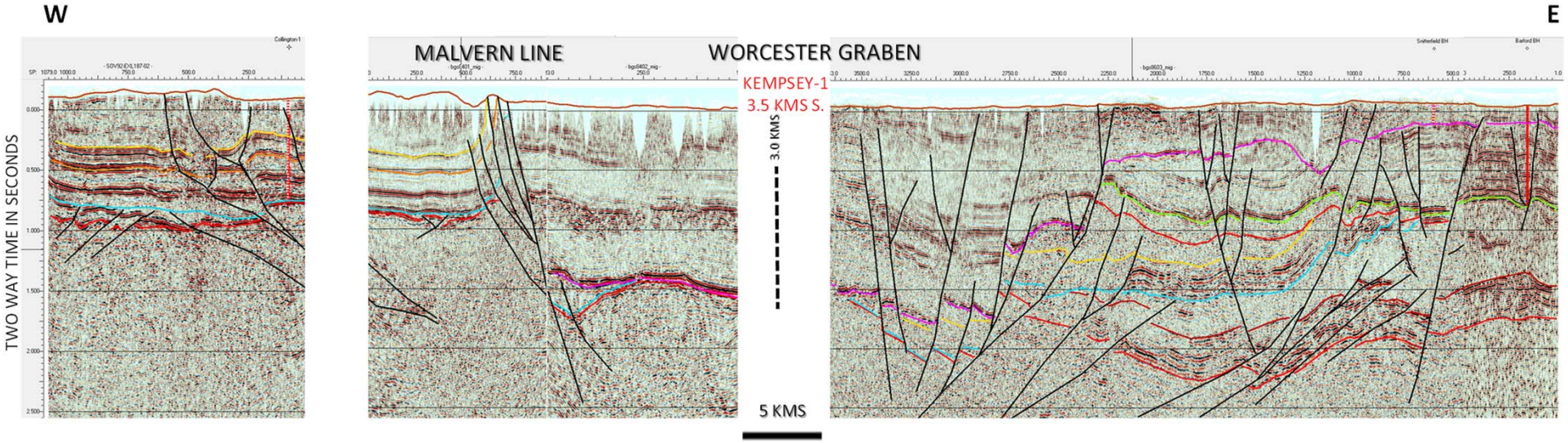
FLATTENED ON VARISCAN UNCONFORMITY



After Butler, 2018

WEST - EAST COMPOSITE LINE ACROSS MALVERNS AND WORCESTER GRABEN

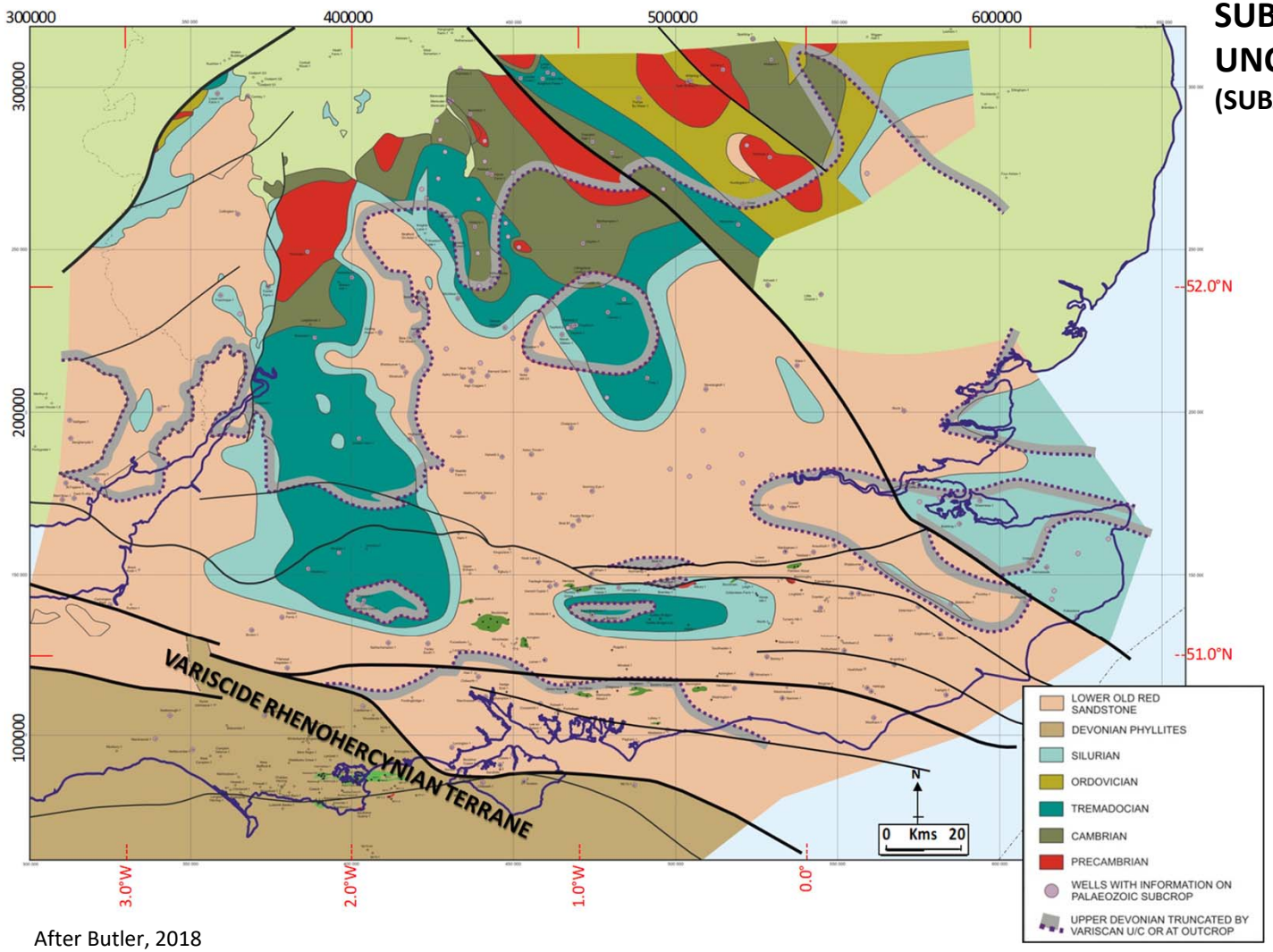
AND INTERPRETATION OF THE LINE FLATTENED ON SHELVEIAN UNCONFORMITY



From: Butler, 2018

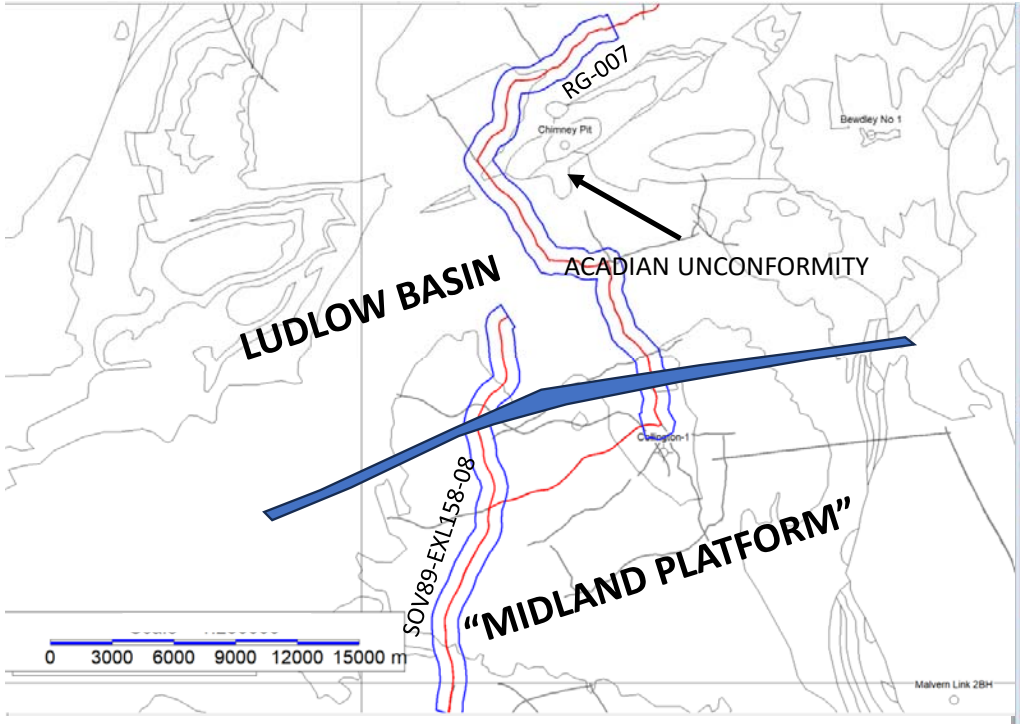
SUBCROP TO ACADIAN UNCONFORMITY

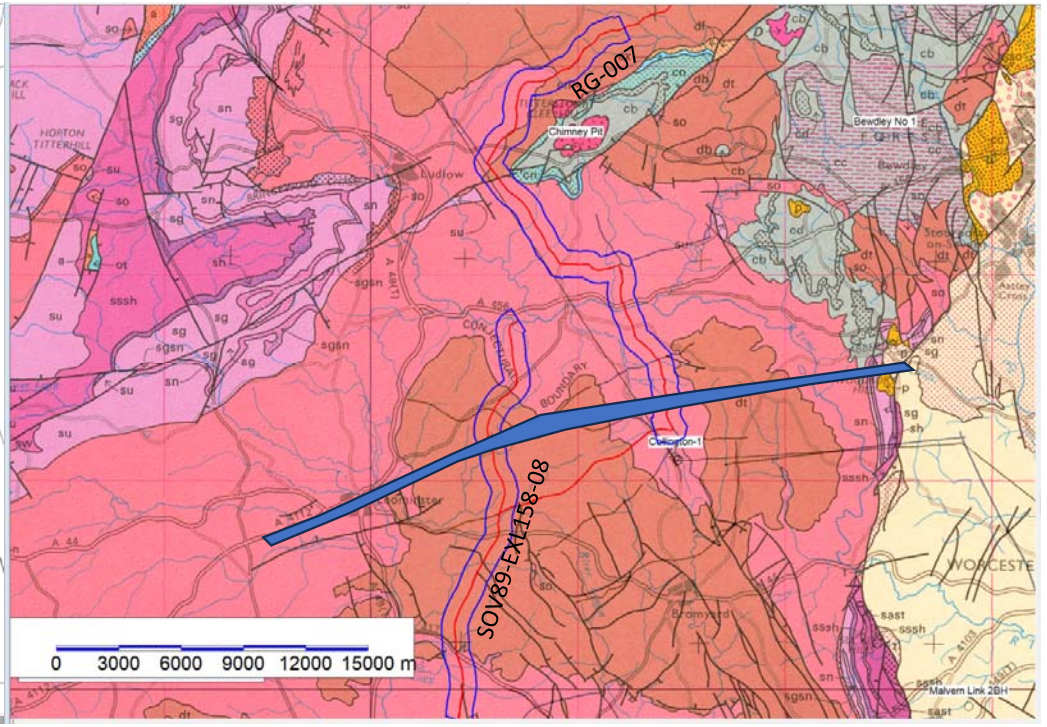
(SUBJECT TO CONSTANT REVISION!)



After Butler, 2018

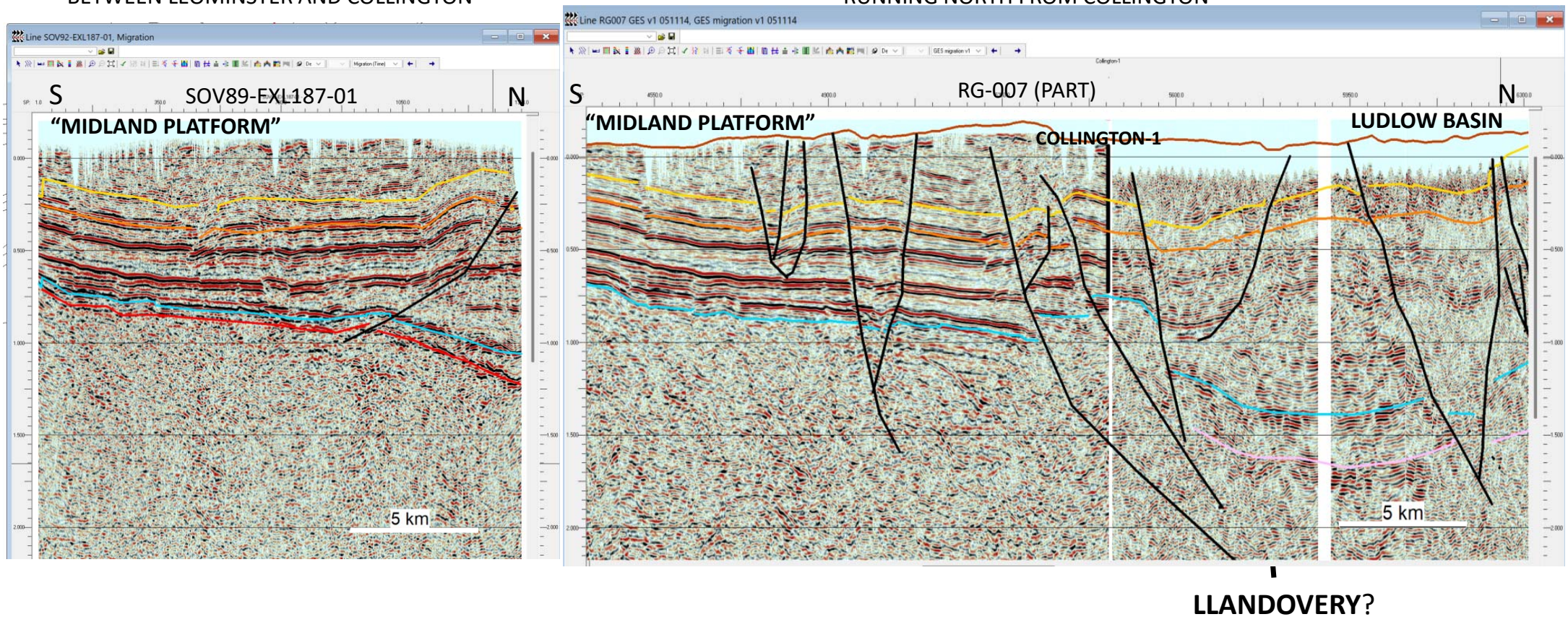
NORTHERN MARGIN OF THE “MIDLAND PLATFORM”





BETWEEN LEOMINSTER AND COLLINGTON

RUNNING NORTH FROM COLLINGTON



Hillier et.al. (2025) describe an asymmetric delta system FROM outcrops of Ludlow-Gorstian age rocks in south-central Wales, with sediment derivation postulated to be from the northern margin of the "Midland Platform" to the southwest of the Ludlow Basin of this study

USEFUL REFERENCES

Butler, A.J., Woodcock, N.H. and Stewart, D.M. 1997. The Woolhope and Usk Basins: Silurian rift basins revealed by subsurface mapping of the southern Welsh Borderlands. *Journal of the Geological Society, London*. Vol 154, 1997, pp.209-223, https://doi.org/10.1144/gsjgs. 154.2.0209

Butler, M, 2018.Seismostratigraphic analysis of Paleozoic sequences of the Midlands Microcraton. *in*: MONAGHAN, A. A., UNDERHILL, J. R., HEWETT, A. J. & MARSHALL, J. E. A. (eds) *Paleozoic Plays of NW Europe.* Geological Society, London, Special Publications, 471, https://doi.org/10.1144/SP471.6

Davies, J.R. 2025. A systems-based lithostratigraphy for the Lower Palaeozoic Welsh Basin and adjoining region. *British Geological Survey Internal Report*, OR/25018. 256pp.

Hillier, R., Waters, R.A. and Davies, J.R. 2025. A Silurian asymmetric compound delta system in south central Wales, UK. *Geological Magazine* 162(e42):1-27. https://doi.org/10.1017/50016756825100289

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EXTRA RAMBLINGS THROUGH A BIT OF THE “PASSIVE” MICROCRATON

NOVEMBER 20th 2025

MALCOLM BUTLER
(UK ONSHORE GEOPHYSICAL LIBRARY)

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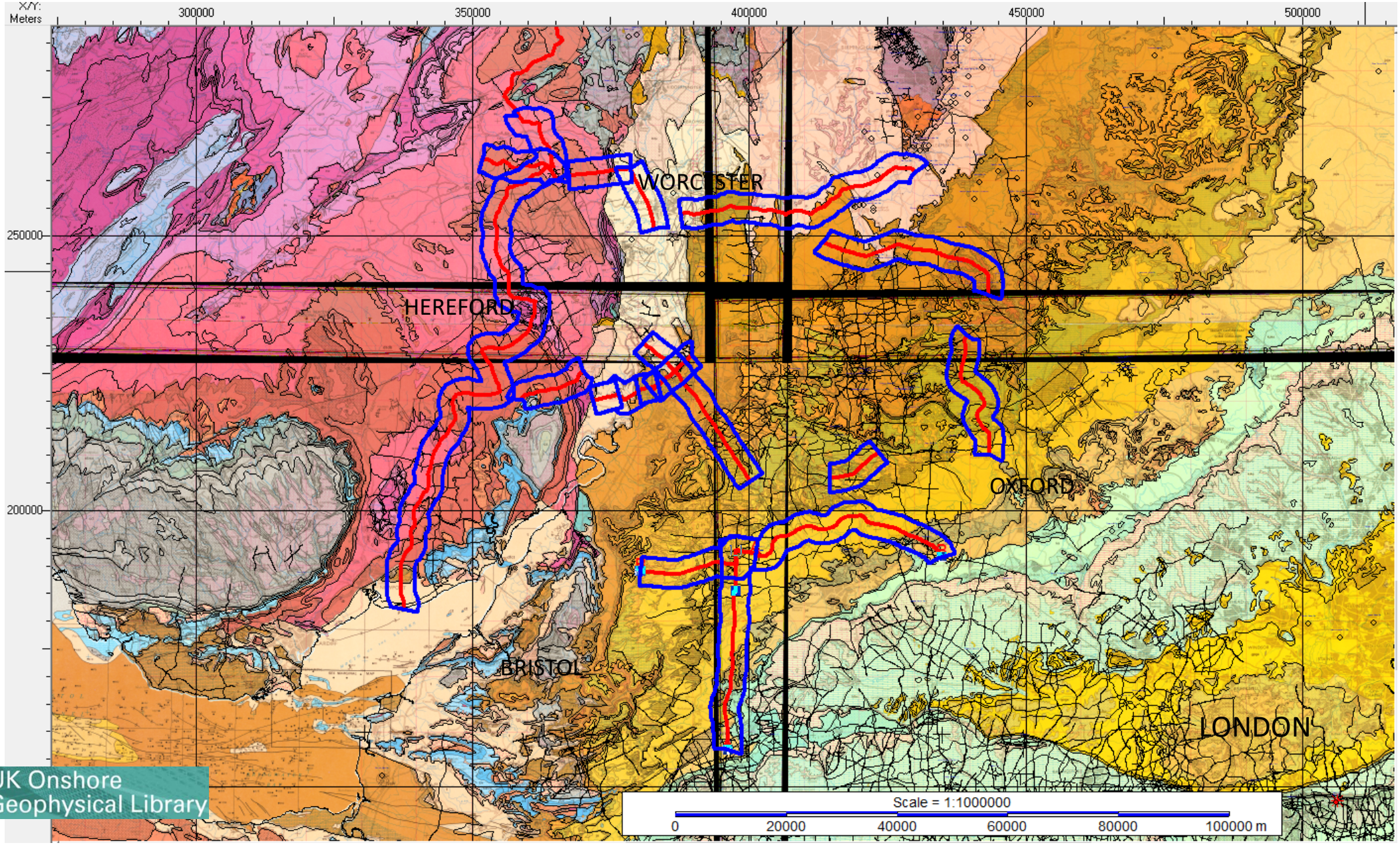
X/Y:
Meters
300000
350000
400000
450000
500000
250000
200000
WORCESTER
HEREFORD
OXFORD
BRISTOL
LONDON
Scale = 1:1000000
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20000
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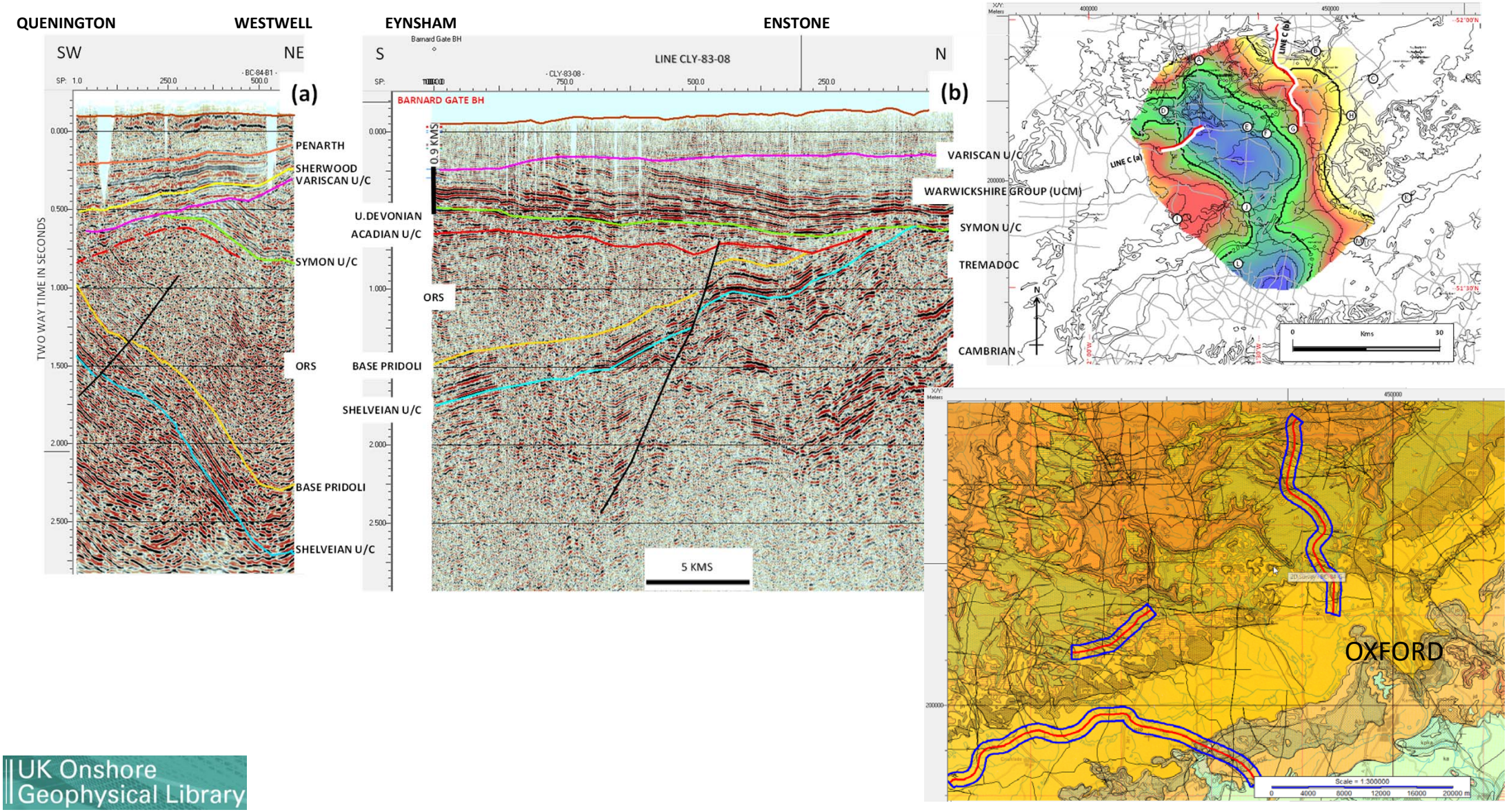
60000
80000
100000 m
UK Onshore
Geophysical Library



UK Onshore Geophysical Library

MALMESBURY

CRICKLADE

COOLES FARM-1

FARINGDON-1

WEST

EAST

TOP LIAS

PENARTH

PENARTH

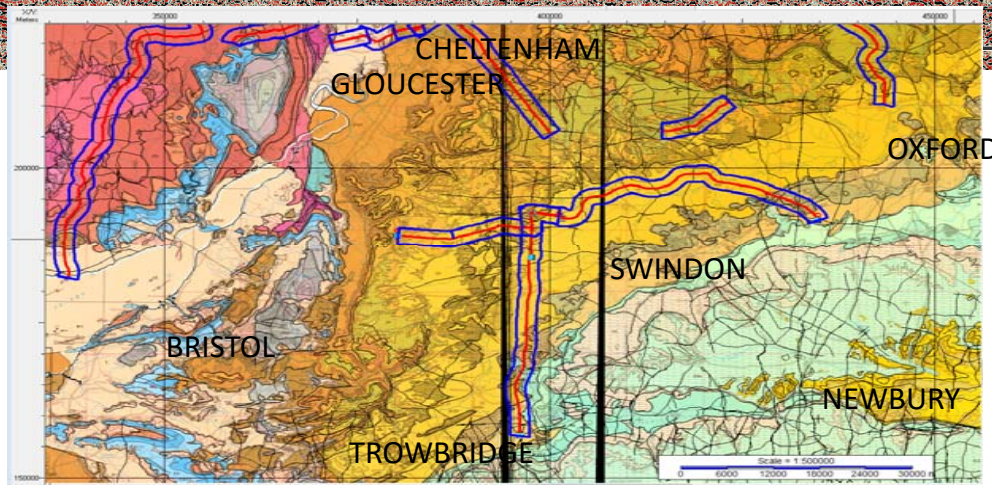
ACADIAN U/C?

BASE PRIDOLI

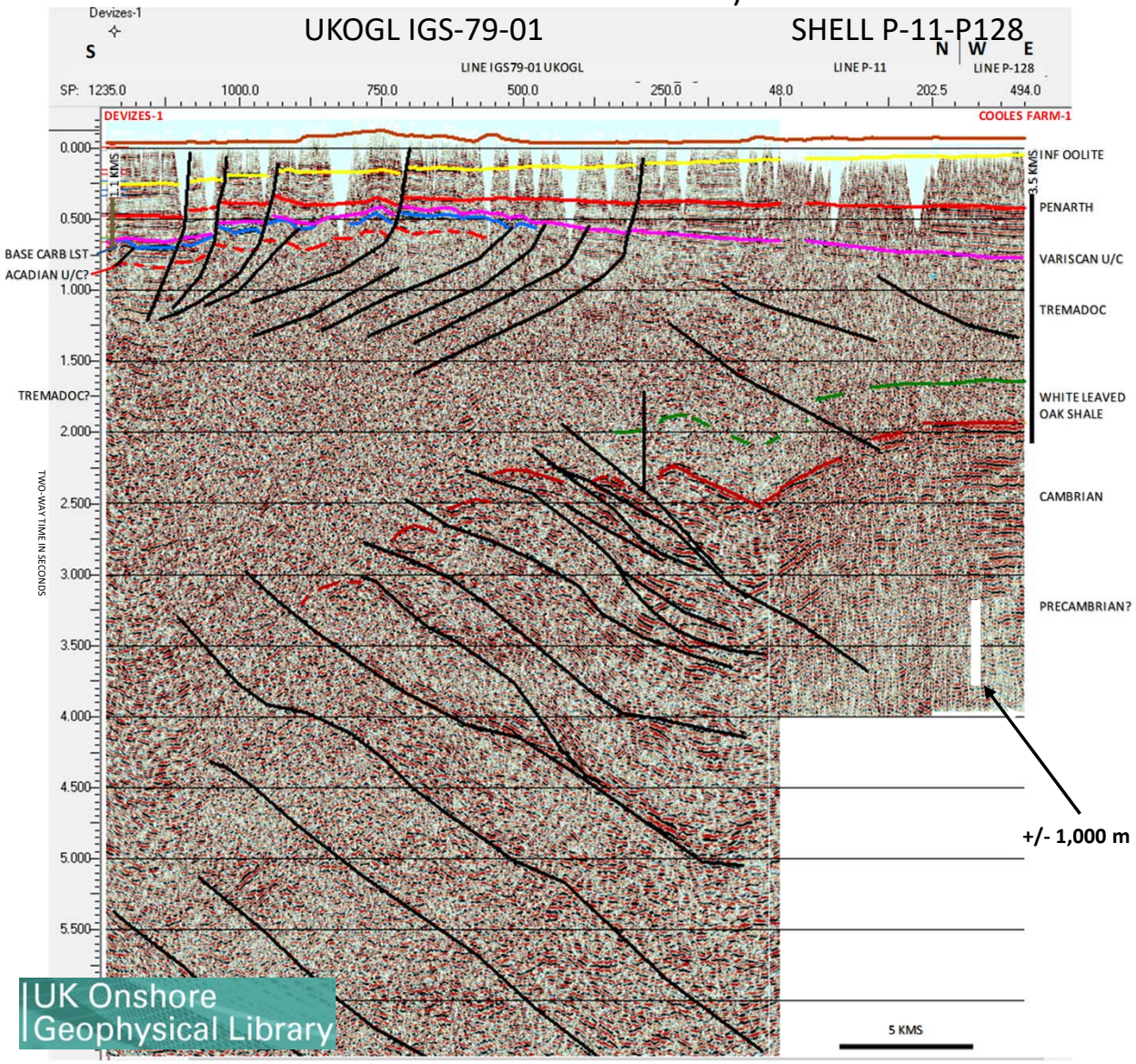
+/- 1,000 m

SHELVEIAN U/C

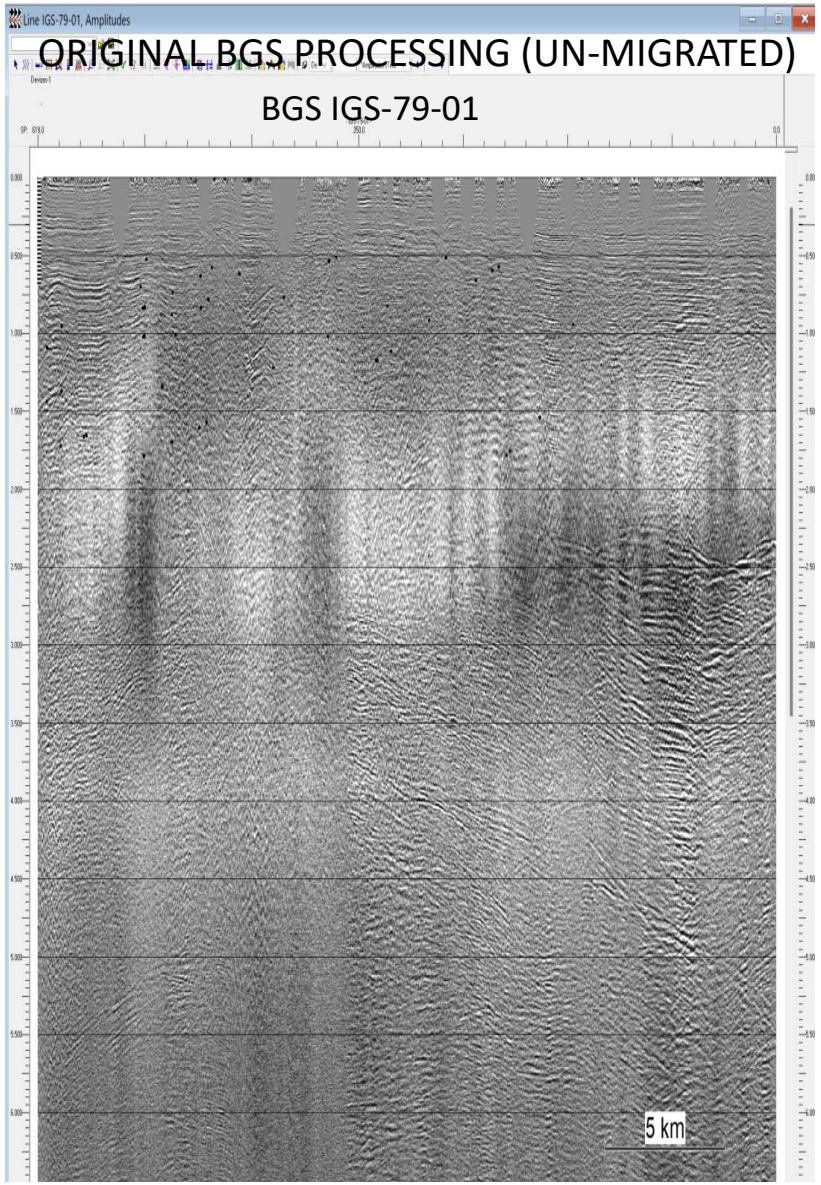
4 km



UKOGL REPROCESSING)



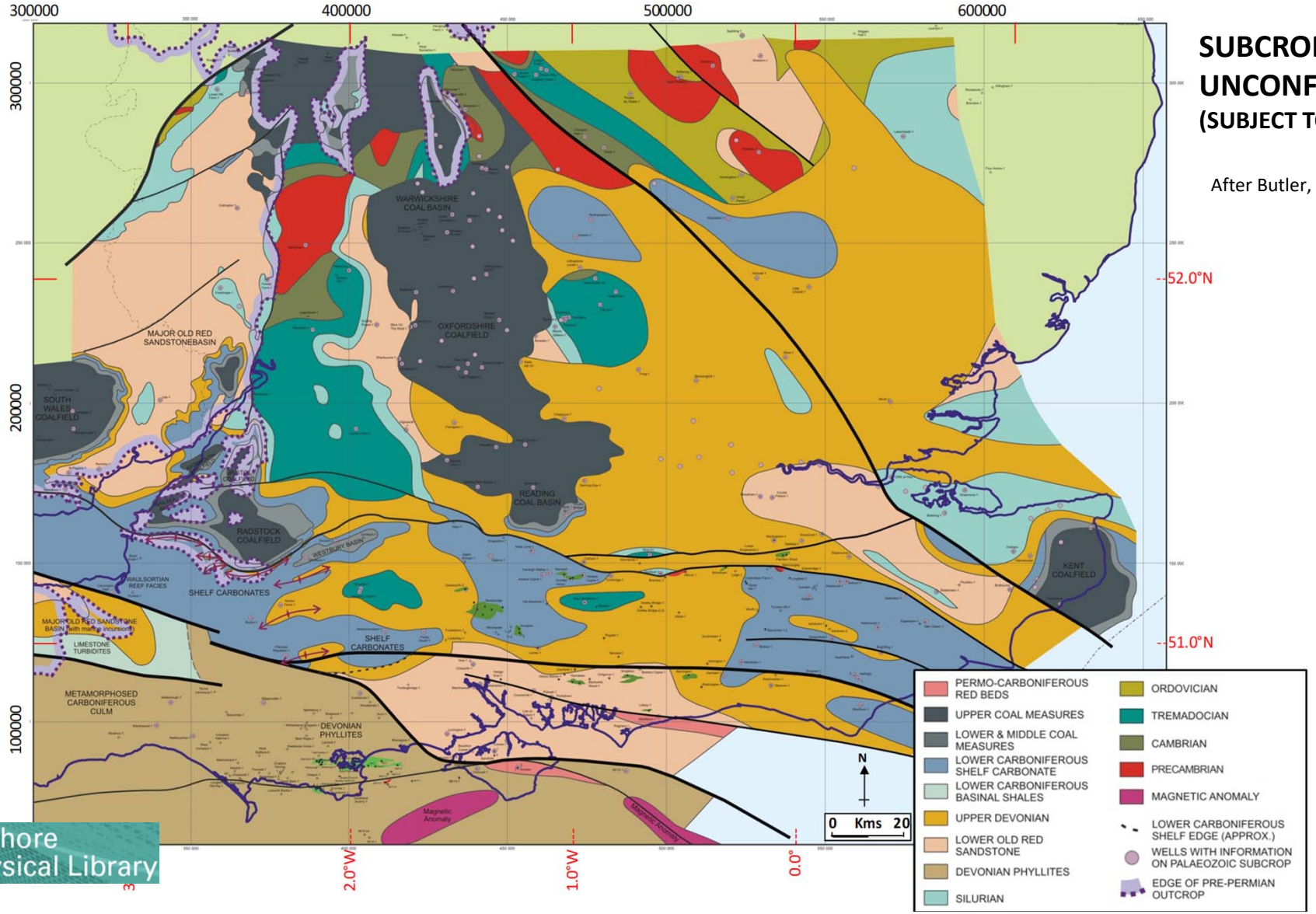
ORIGINAL BGS PROCESSING (UN-MIGRATED)

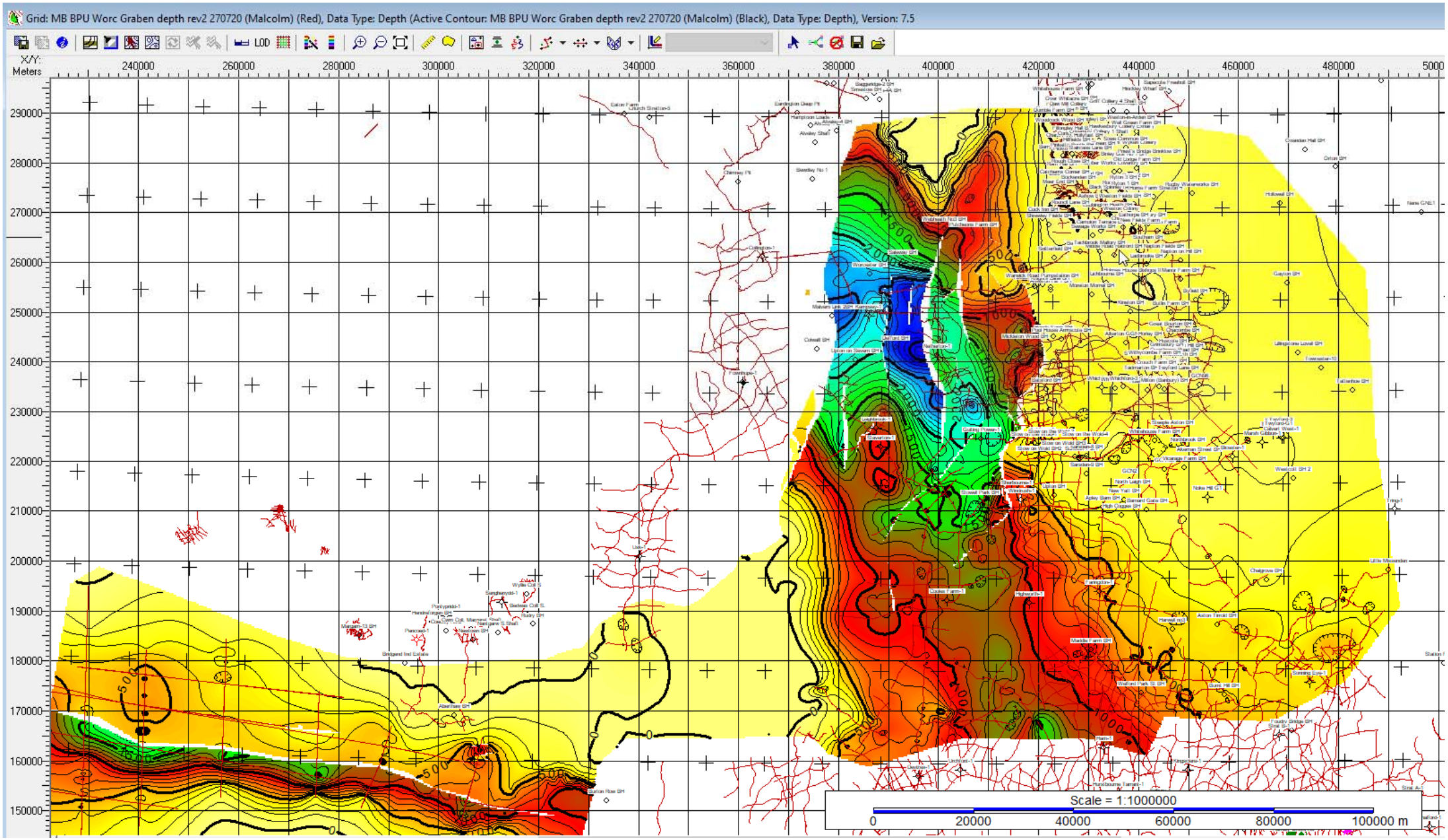


SUBCROP TO VARISCAN UNCONFORMITY

(SUBJECT TO CONSTANT REVISION!)

After Butler, 2018




Grid: MB BPU Worc Graben depth rev2 270720 (Malcolm) (Red), Data Type: Depth (Active Contour: MB BPU Worc Graben depth rev2 270720 (Malcolm) (Black), Data Type: Depth), Version: 7.5
X/Y: Meters
240000
260000
280000
300000
320000
340000
360000
380000
400000
420000
440000
460000
480000
290000
280000
270000
260000
250000
240000
230000
220000
210000
200000
190000
180000
170000
160000
150000
Scale = 1:1000000
0
20000
40000
60000
80000
100000 m